RADIOSENSITIVITY IN PLANTS *

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1. Introduction

The aim of this chapter is to present a compilation of available data on the sensitivity of plants to ionizing radiation, and to provide basic information on methods of determining such sensitivities, or of estimating radiosensitivities by calculation of the nuclear factors upon which they depend. The scope of the data presented here is necessarily limited to the most generally useful radiobiological end points and to the most commonly-used types of radiation. Many of the factors which influence radiosensitivity, particularly nuclear factors, will be discussed.

Emphasis will be upon whole-plant studies done at Brookhaven National Laboratory by A. H. Sparrow and his associates, since these studies are the source of most of the available radiosensitivity data and of all the sensitivity predictions listed here. More detailed information on whole-plant irradiation methods, data interpretation and prediction criteria may be found in earlier reviews by Sparrow, Schwemmer & Bottino (1971), Sparrow & Schwemmer (1974) and Underbrink & Pond (1976). Seed irradiation data are given for several end points; additional data on seed irradiation have been compiled by Osborne & Lunden (1961) and Osborne & Constantin (1966).

Data presented here include summaries of experimentally-determined radiosensitivities at various end points for both herbaceous and woody higher plants, and for a few species of ferns and lower plants. The algae and fungi have not been considered here due to space limitations. However, radiosensitivities have been determined for 23 species of blue-green algae (Kraus 1969), 47 species of lichens (Woodwell & Gannutz 1967), and the green algae Chlorella and Chlamydomonas (Posner & Sparrow 1964).

In the major tables appended here, data on nuclear characters are listed for over a thousand species of higher plants, together with derived estimations of radiosensitivities and of ^{32}P DNA content. The sensitivity estimates may be considered to be fairly reliable (within a factor of two, over a range of nearly 300-fold), since the relationship of nuclear characters to radiosensitivity has been well-established (Sparrow & Schwemmer 1974; Underbrink & Pond 1976). A similar relationship exists between nuclear characters and DNA content, and between DNA content and radiosensitivity (Baetcke, Sparrow, Nauman & Schwemmer 1967). Direct determination of DNA content by Feulgen microspectrophotometry or by chemical extraction is obviously preferable to estimation of DNA content based upon nuclear volume; however, a plot of nuclear volumes against spectrophotometrically- or chemically-determined ^{32}P DNA for over 100 species shows an

excellent correlation (Fig. 1). Further, the entire body of estimated-DNA data listed here is consistent, having issued from a single laboratory using standardized techniques. Therefore, estimated ^{32}P DNA contents are included in these tables, in the expectation that they may serve as a useful supplement to more precise DNA values presented elsewhere in this volume. The primary purpose of the tables, however, is to present a comprehensive summary of data on plant radiosensitivity and on related nuclear factors, which should prove to be a valuable source of information for the radiobiologist, cytologist, cytotaxonomist, or the ecologist requiring an estimation of probable effects of radiation upon plant populations.

2. Historical notes

Prior to the availability of large and relatively inexpensive sources of ionizing radiation, plant radiosensitivity studies were few and limited. The first major facility for plant irradiation was the ^{60}Co gamma field installed at Brookhaven National Laboratory in 1948. Similar facilities were later constructed at other institutions throughout the world (Sparrow 1960). Although some use was made of the Brookhaven gamma field for the production of useful mutations in crop and ornamental plants (Sparrow & Konzak 1958), its primary use was as a radiobiological research tool. The ability to irradiate many different species under the same environmental conditions, and at a wide range of exposures and exposure rates, made it possible to study the nature and extent of the large differences in radiosensitivity which exist among plant species. The subsequent development of more versatile and sophisticated means of irradiation, such as a fallout decay simulator and a controlled-environment irradiation facility (Sparrow 1966), further enhanced experimental capability. In addition, a gamma source placed in a forest community at Brookhaven permitted observation of long-term radiation effects on a natural ecosystem (Woodwell & Sparrow 1965; Woodwell & Rebeck 1967; Woodwell & Whittaker 1968).

A major part of both pioneering and later work in comparative plant radiosensitivity was done at Brookhaven by Sparrow and his colleagues. Early in their work they observed a wide range in sensitivity among species, and noted that increased sensitivity appeared to be correlated with such nuclear factors as increased chromosome size (Sparrow & Christensen 1953; Sparrow & Gunckel 1956) and increased nuclear volume and nuclear DNA content (Sparrow & Miksche 1961; Sparrow, Cuany, Miksche & Schairer 1961).

Further experimentation and quantification demonstrated convincingly that the major determining nuclear factor in plant radiosensitivity was the size of an average interphase chromosome, whether expressed as chromosome volume (Sparrow 1965b; Sparrow, Sparrow, Thompson & Schairer 1965) or as DNA content per

chromosome (Baetcke, Sparrow, Nauman & Schwemmer 1967). Later studies gave still further confirmation of the correlation between various sensitivity endpoints and chromosome size (Sparrow, Rogers & Schwemmer 1968; Sparrow, Schwemmer & Bottino 1971; Sparrow & Schwemmer 1974). Thus it became possible, on the basis of interphase chromosome volume (ICV), to predict the sensitivity of a previously-untested plant species, or even, as shown by Sparrow & Schwemmer (1974), to construct a predicted survival curve.

A bibliography of early plant radiobiological work was compiled by Sparrow, Binnington & Pond (1958), and more recent studies in comparative plant radiosensitivity have been summarized in a comprehensive review by Underbrink & Pond (1976).

3. Methods for determining radiosensitivity

(a) Types and sources of radiation

The basic types of ionizing radiation used in the study of plant radiosensitivity are electromagnetic (X rays, gamma rays) and particulate (neutrons, electrons, protons, alpha or beta particles). Ultra-violet rays, although nonionizing, are occasionally used. This discussion will be concerned only with X and gamma rays, since they have been the basis for most radiosensitivity studies by virtue of their being the easiest and most economical to use, the most readily available, and the most versatile. The convenience of an X-ray machine makes X rays more useful than gamma rays for acute exposures of small plants, portions of plants, seeds, or cultures of unicellular organisms.

Gamma rays are uniquely suited to studies of chronic irradiation of growing plants, and were initially used at Brookhaven in such facilities as the gamma field and gamma greenhouse, with plants arranged in isodose arcs around a ^{60}Co or ^{137}Cs source. The latter is generally preferable because of its longer half-life and lower energy which necessitates less shielding. Later studies using acute exposures as well as more carefully-controlled chronic exposures have utilized a controlled-environment radiation facility where several ^{137}Cs sources of various strengths were used. The largest of these sources (12000 Ci) provides for selective attenuation of exposure by means of a series of 5 concentric telescoping shields which provide a wide range of exposure rates within a relatively small space, and permits exposures to be done under conditions of controlled temperature and humidity. This system is also adaptable for simulating the decreasing radiation levels associated with fallout by sequentially telescoping the shields to reduce the exposure rate at appropriate intervals (Sparrow & Puglielli 1969). This facility and other types of gamma sources are described in greater detail by Sparrow & Puglielli (1969) and by Sparrow (1961, 1966).

(b) Exposure and exposure rate

The units of radiation in general use are the Roentgen (R) and the rad. The Roentgen is the more commonly used in plant studies, but since they differ by a very small factor ($1 \text{ rad} \approx 0.96 \text{ R}$), they may for all practical purposes be used interchangeably (U. S. Bureau of Standards Handbook 85, 1962).

Total exposure may be thought of as the total amount of radiation received, and exposure rate as the amount of radiation received per given unit of time. Exposures may be acute or chronic. There is no clear dividing point, but generally with acute irradiations the total exposure is given in a short period of time (minutes or hours) at a relatively high exposure rate, while chronic exposures last for longer periods, sometimes years, at a constant and relatively low exposure rate. In most of the irradiation studies reported from Brookhaven after 1966, a standard acute gamma irradiation treatment was given in 16 hours, with the desired total exposure obtained by varying the exposure rate; chronic exposures generally lasted for about 8 - 12 weeks for herbaceous plants and up to 8 years for woody plants. In fallout decay simulation (FDS) studies, exposure rate begins at a high level and is reduced in stepwise fashion over a 36-hour period to simulate radioactive fallout decay.

(c) Experimental end points

Comparisons of plant radiobiological data are made more difficult by the diversity of end points which may be scored. The most commonly assessed end points result either from loss of reproductive integrity of meristematic or reproductive cells or from direct damage to chromosomes.

Meristematic damage is generally reflected in growth inhibition or plant mortality. In earlier studies, especially with chronic irradiation, damage was estimated in terms of either slight or severe growth inhibition, defined as about 80-90 percent or 15 percent of control growth, respectively. However the criteria for determining these two end points were somewhat imprecise, leading to difficulties in quantitation and statistical analysis. In later studies, lethality has proven to be a much more accurate and useful end point. Lethality is expressed as LD_n , a term which indicates the exposure in R that will reduce survival by n percent from the control value.

Damage to plant reproductive tissue may be assessed through such end points as percent of pollen abortion (Yamakawa & Sparrow 1966; Underbrink, Sparrow, Pond, Takahashi & Kappas 1973) or reduction in seed set (Yamakawa & Sparrow 1965). Following irradiation of seeds, damage may be expressed in decreased

germinability of seeds or in decreased growth or survival of seedlings (Osborne & Lunden 1961; Osborne & Constantin 1966). Chromosome damage may be evaluated by scoring for numbers of chromosome aberrations, chromosome fragments, or micronuclei (Evans & Sparrow 1961; Sparrow & Evans 1961). Somatic color mutations in stamen hair cells of Tradescantia flowers have proven to be a highly useful end point, since the unique sensitivity of these cells makes possible the detection and evaluation of the effects of extremely low doses of radiation (Sparrow, Underbrink & Rossi 1972; Underbrink, Schairer & Sparrow 1973). Somatic color mutations may also be scored in flower petals (Sparrow, Baetcke, Shaver & Pond 1968). More detailed discussion and more complete references on all of these end points may be found in Underbrink & Pond (1976).

(d) Survival curves

A survival curve is constructed by plotting log of plant survival as percent of control against each exposure given. As shown in Figure 2, these curves generally have a shoulder of varying width, where the effect on survival is negligible, before they turn over and become exponential. After fitting a curve to the data points, LD_n may be determined by taking 100 - n percent survival (n percent lethality) on the y axis and reading off the appropriate exposure from the x axis.

Other parameters which may be calculated from a survival curve are D_0 and D_q , as shown in Figure 2. D_0 is a measure of the steepness of the slope, and is the dose that reduces survival to 37 percent on the exponential portion of the curve. It is thought to indicate the dose necessary to produce an average of one hit per target. D_0 may be determined by taking an arbitrary level of survival from the straight-line portion of the survival curve (a in Fig. 2), and determining the dose necessary to reduce that survival level by 63 percent, or conversely to 37 percent of the original level (b in Fig. 2). For example, in Fig. 2, a = 40% survival, at 20 kR; b = 37% of a or 14.8% survival, at 28 kR; and D_0 is the difference between these two doses, or 8 kR. D_0 may also be determined by taking the reciprocal of the slope of the straight-line portion of the curve after computing a least-squares best fit. D_q is a measure of shoulder width, and is the point on the x axis at which the exponential portion of the curve, extrapolated upward, intersects 100 percent survival (see Fig. 2). D_q is considered to represent the dose below which cells are able to repair radiation-induced damage.

Although D_0 and D_q are generally used only for single-celled systems, these parameters have been adapted to whole-plant studies by Sparrow & Schwemmer (1974), who have shown them to be highly correlated with chromosome size (Fig. 3). Therefore, given the ICV of a species, the whole-plant D_0 and D_q , as well as other

mortality end points, may be estimated, and thus a predicted survival curve may be constructed. These relationships are discussed in greater detail by Sparrow & Schwemmer (1974) and by Underbrink & Pond (1976).

4. Correlation of nuclear factors with radiosensitivity

(a) Nuclear volume and nuclear DNA content

The first quantitative investigation of nuclear factors as related to plant radiosensitivity focused upon nuclear size (Sparrow & Miksche 1961). Although preliminary observations had indicated an apparent correlation of sensitivity with chromosome size (the larger the chromosomes the lower the dose needed to reach a specified end point) (Sparrow & Christiansen 1953; Sparrow & Gunckel 1956), the quantitative measurement of metaphase chromosomes for a large number of species would have been prohibitively tedious and time-consuming. Therefore since there appeared to be a close correlation between metaphase chromosome size and interphase nuclear volume (Sparrow & Miksche 1961), the more easily-determined nuclear volume was measured instead.

The criterion of radiation damage in these early studies was severe growth inhibition, or 15% of control growth, and it was assumed that such inhibition was caused by loss of reproductive integrity of the cells in the vegetative meristem; therefore, the nuclei initially selected for measurement in control plants were those in the actively proliferating portion of the shoot meristem. Nuclei of the root meristem were also measured, and their average size was found not to vary significantly from that of shoot nuclei (Sparrow & Miksche 1961), an observation which was confirmed by later studies (Baetcke, Sparrow, Nauman & Schwemmer 1967; Sparrow & Nauman, unpublished data).

The results of this first investigation (Sparrow & Miksche 1961) showed a close inverse correlation between the volume of the interphase meristematic nucleus in shoot or root and the exposure necessary to produce severe growth inhibition in 23 plant species (see also Sparrow, Cuany, Miksche & Schairer 1961). They also showed a direct positive correlation between nuclear volume and nuclear DNA content, later confirmed by Baetcke, Sparrow, Nauman & Schwemmer (1967) (Fig. 4a), who concomitantly showed a direct correlation between DNA per chromosome and ICV (Fig. 4b). A similar correlation was found between nuclear DNA content and radiosensitivity (Sparrow & Miksche 1961; Bowen 1962). Hence a direct positive correlation between nuclear volume and radiosensitivity was inferred. However, these early studies were limited to diploid species with relatively little variation in chromosome number, and later work, outlined below, showed that

nuclear volume or nuclear DNA content are correlated with radiosensitivity only so long as there is little variation in chromosome number; when chromosome number varies widely, the correlation does not hold. Therefore nuclear volume cannot be used as the basis for any comprehensive system for prediction of plant radiosensitivity.

(b) Interphase chromosome volume and chromosomal DNA content

Sparrow & Miksche (1961), while establishing the correlations noted above, also noted that there was a better correlation of radiosensitivity with DNA content per chromosome than with DNA per cell. In view of this apparent relationship between sensitivity and chromosomal DNA content, and of the demonstrated relationship between nuclear DNA content and nuclear volume, it seemed logical to assume that there would be a similar correlation between sensitivity and average interphase chromosomal volume, or ICV. ICV could be estimated easily by dividing nuclear volume by somatic chromosome number (Sparrow & Evans 1961). It was subsequently shown that there was indeed a close correlation between ICV and acute lethal dose, with the plotted regression having a slope not significantly different from -1 (Sparrow, Schairer & Sparrow 1961). Further work by Baetcke, Sparrow, Nauman & Schwemmer (1967) confirmed the correlations of chromosomal DNA with radiosensitivity (Fig. 5a) and of ICV with radiosensitivity (Fig. 5b).

Other studies provided additional confirmation of the direct positive correlation of ICV with radiosensitivity, which was found to hold for various lethality or growth inhibition end points in both acute and chronic exposures of herbaceous plants (Sparrow & Schwemmer 1974; Sparrow, Sparrow, Thompson & Schairer 1965) (Figs. 6, 7), and in chronic exposures of woody plants (Sparrow, Schwemmer, Klug & Puglielli 1970a,b) (Fig. 8). The only exception was found in acutely irradiated woody plants, scored two years after irradiation. They showed an equally close correlation between ICV and exposure at various end points, but with regressions having shallower slopes (-0.73 as opposed to -1 in all other correlations) (Sparrow, Rogers & Schwemmer 1968) (Fig. 9). No explanation has been found for this apparent anomaly, nor for the fact that woody plants are in general more sensitive than herbaceous plants of similar chromosomal size (Sparrow & Sparrow 1965). These differences are apparent in Figure 10, which is a composite of regressions of exposure versus ICV for various end points, including whole-plant D_0 and D_q (Underbrink & Pond 1976).

Since the slopes of regressions of LD_n vs ICV do not vary significantly from -1 (except as noted above), the product of exposure in kR times ICV in μm^3 at any point on the regression will approach a constant, and will indicate the quantity of energy

absorbed per average interphase chromosome at that end point. Thus for any end point the energy absorbed per chromosome is the same, regardless of differences in chromosome size, chromosome number, or exposure required to reach that end point.

Energy absorption per chromosome (E/Ch) is generally expressed in MeV, and may be summarized by the formula $E/Ch = ICV \times LD_n \times 60.2$, where 60.2 is the product of 34 eV per ion pair (corrected from an earlier estimate of 32.5) times 1.77 ionizations per μm^3 of wet tissue per R. This concept is discussed in greater detail by Sparrow (1962), Sparrow, Schairer & Sparrow (1963), Sparrow & Schwemmer (1974) and Underbrink & Pond (1976).

As a corollary to these findings, Sparrow, Underbrink & Sparrow (1967) noted that, for a wide variety of organisms from viruses to higher plants and animals, a plot of D_0 against ICV (defined here as the volume of a chromosome, bacterial nucleoid or virus particle) resulted not in a single regression line but in a series of eight parallel regression lines, all with slope = -1 (one line later modified by Sparrow, Howard, Cowie, Schwemmer & Nauman 1975). Thus there are for these organisms eight different levels of energy absorption at D_0 . They have been designated "radiotaxa", although they are not entirely uniform with regard to conventional taxonomy. These groups are non-overlapping and have been shown to be valid by critical statistical evaluation (Kaufman & Miller 1970). Although their significance is not understood, these groupings probably reflect structural and physiological parameters which result in particular levels of energy absorption at D_0 .

It should be emphasized that, while ICV is the single most useful nuclear parameter in estimating radiosensitivity, it is a purely conceptual quantity, being simply an estimate of the volume of an average interphase chromosome. It does not take into account such factors as bimodality of chromosome size, nor does it allow for nucleoli, other nuclear components, or interchromosomal space; thus the true volume of a chromosome is always smaller than the calculated ICV. Conger (1970) has calculated that the fraction of ICV that is actual chromosomal volume is 0.17 to 0.18. Nevertheless, ICV as it is defined here - that is, meristematic nuclear volume divided by somatic chromosome number - has proven to be a highly useful, reasonably accurate (to within a factor of two) and easily-determined index of radiosensitivity. If the nuclear DNA content of a species is known, its ICV may be estimated by dividing 3C DNA per nucleus (in pg) by chromosome number and multiplying by 15, since 1 pg of DNA is equivalent to about $15 \mu m^3$ of nuclear or chromosomal volume (Baetcke, Sparrow, Nauman & Schwemmer 1967). Radiosensitivity of a previously-untested plant species may then be estimated from this figure.

(c) Chromosome number

When earlier studies showed increased radioresistance in polyploids relative to their corresponding diploids, it was thought that this was a result of the protective effect of genetic redundancy. While this is probably true in cases of artificially-induced autopolyploidy where there has been little change in chromosome size or in genetic makeup, it was later realized that the increased resistance of polyploids was probably due mainly to their smaller chromosomal size relative to corresponding diploids, and that, in general, ICV was still the major determining factor in radiosensitivity (Sparrow, Sparrow, Thompson & Schairer 1965; Ichikawa 1970).

There are special cases involving variation in chromosome number where the relationship is less clear, specifically haploidy and high levels of polyploidy. Conger, Sparrow, Schwemmer & Klug (1979) have investigated the relationship of ploidy level to sensitivity in 11 plant genera which together span a ploidy range of $1x$ to $22x$. Despite a lack of inter- and intrageneric consistency, they confirmed the role of ICV as the major determinant of radiosensitivity at most ploidy levels. However, they found a considerably increased sensitivity in haploids and in plants with ploidy levels of $10x$ or above. Their findings are summarized and discussed by Underbrink & Pond (1976).

Because of inconsistencies and contradictions both in published chromosome counts and in taxonomic attribution, it is always advisable to determine the actual chromosome number of a plant along with its nuclear volume or DNA content (see Appendix) when estimating the radiosensitivity of an untested plant.

(d) Related factors

Meiotic and mitotic cycle times have been shown to be related to nuclear and chromosome volume and to DNA content, and thus may be considered to be indirectly related to radiosensitivity. Underbrink & Pond (1976) have plotted data on mitotic cycle time and on duration of the S period, taken from Van't Hof (1975), against ICVs estimated from DNA content, and found a definite positive correlation in both cases. A similar plot of meiotic cycle time, taken from Bennett (1972), against estimated ICV showed a much closer correlation (Underbrink & Pond 1976). Thus, if cycle time is the only known nuclear parameter for a given plant, one of these plots can be used for a very rough estimate of ICV, which will in turn give a preliminary indication of where

the particular plant would be likely to fall within the overall range of plant radiosensitivities.

5. Correlation of biological, environmental and experimental factors with radiosensitivity

Plant radiosensitivity may be altered or complicated by the effects of a great number of variables. The following list of such factors is modified from Sparrow, Schwemmer & Bottino (1973), after Gunckel & Sparrow (1961).

Cytological and genetic factors

1. Chromosome number and ploidy level
2. Chromosome volume
3. Chromosomal DNA content
4. Length of mitotic cycle
5. Stage of mitotic or meiotic cycle
6. Amount of heterochromatin
7. Number and position of centromeres
8. Genotype
9. Taxonomic group

Morphological and developmental factors

1. Type of cell or tissue
2. Stage of development or differentiation
3. Portion(s) of plant irradiated
4. Size of plant or depth of sensitive organs
5. Life form (woody, herbaceous)
6. Life span (annual, perennial)
7. Type of reproduction (sexual and/or vegetative)

Physiological factors

1. Age of plant or tissue
2. Metabolic rate
3. Growth rate
4. Stage of growth cycle (active, dormant)
5. Concentration of growth hormones
6. Concentration of protective or sensitizing substances
7. Water content
8. Nutritional state
9. Diseased tissue

Experimental factors

1. Exposure rate
2. Exposure duration
3. Exposure fractionation or previous exposure
4. Kind(s) of radiation
5. Energy or LET of radiation
6. Postirradiation time
7. Depth dose
8. Shielding

Environmental factors

1. Temperature, including diurnal variations
2. Light intensity
3. Day length
4. Relative humidity
5. Oxygen concentration
6. Wind velocity
7. Competition
8. Insects or other pests
9. Soil conditions - chemical composition, pH, density, moisture content
10. Natural shielding (vegetation, snow, etc.)

Several of the factors listed have already been discussed, and the importance of some others is self-evident. For example, the adverse effects of disease, poor nutritional conditions, presence of insect pests, or environmental competition would all tend to increase the susceptibility of a plant to radiation damage.

With regard to the cytological factors listed, a higher degree of sensitivity would be expected, in general, to be associated with a lower chromosome number, lower ploidy level, larger chromosome volume and DNA content, much heterochromatin, slower mitotic or meiotic cycle time, normal as opposed to diffuse centromeres and acrocentric rather than metacentric chromosomes (Evans & Sparrow 1961; Sparrow 1961; Sparrow, Cuany, Miksche & Schairer 1961).

Plants within certain taxonomic groups tend to have predominantly very large or very small chromosomes, and so can be expected to have relatively high or low radiosensitivities. Examples of highly sensitive groups are the Pinaceae, particularly Pinus species, and indeed most of the conifers; the cyads; and many genera in the Liliaceae, notably Fritillaria, Lilium, Allium, and Trillium. At the other extreme, one could expect to find very small chromosomes and low radiosensitivities in the Crassulaceae, such as Sedum and Graptopetalum, and in the Cruciferae. One should be cautious, however, in generalizing on the basis of

taxonomy, since within the genus Tradescantia, for example, there is a range in chromosome size and thus in sensitivity of at least 15-fold.

Taking the larger taxonomic groupings into consideration, the gymnosperms as a whole are much more sensitive than the woody angiosperms (Sparrow, Rogers & Schwemmer 1968). Among the herbaceous plants, taxonomic class (monocot or dicot), considered in combination with life span, could be useful in predicting probable relative sensitivity at the upper (more sensitive) end of the range. While distributions of dicots and monocots overlap in the region of low sensitivity, virtually all large-chromosome high-sensitivity plants studied (ICVs of $50\mu\text{m}^3$ or more, LD₅₀s of 1.5 kR or less) are monocots (data in Table 5). Similarly, annuals and perennials also overlap at the lower end of the sensitivity range, but all plants studied with ICVs of $35\mu\text{m}^3$ or more (LD₅₀s of less than 2.2 kR) are perennials (data in Table 5). Thus, if one wished to choose a highly-sensitive plant for radiation studies, a logical starting point would be the monocotyledonous perennials or gymnosperms.

Many of the morphological, developmental and physiological factors listed above are discussed in some detail by Sparrow, Schwemmer & Bottino (1971), and also by Sparrow & Woodwell (1962), who deal with radiation responses at the population level. Some biochemical factors which affect plant radiosensitivity are listed by Gunckel & Sparrow (1961), and will not be enumerated here.

Woody and herbaceous plants respond similarly to irradiation in that there is a linear relationship between ICV and exposure at a given endpoint. However there are important differences in response which are presented visually in Figure 10. The regression lines for chronic exposures in both groups have the same slopes (= -1) but different intercepts, with woodies being more sensitive for a given endpoint. With acute exposures, the woodies are again more sensitive, but with shallower slopes than those of the herbaceous species. No satisfactory explanation has been offered for the differences, but relevant data and discussion are presented by Sparrow, Rogers & Schwemmer (1968) and Sparrow, Schwemmer, Klug & Puglielli (1970a,b).

These authors have also shown that the radiosensitivity of woody plants decreases during the dormant period. This is not unexpected, since it is also a time of lesser mitotic activity and decreased nuclear volume. Sparrow, Schwemmer, Klug & Puglielli (1970a) found an active-to-dormant nuclear volume ratio of 1.54, which agrees well with similar ratios found in earlier studies by Sparrow, Rogers & Schwemmer (1968) and Taylor (1966).

Many herbaceous plants reproduce asexually as well as, or instead of, sexually. This factor tends to decrease their radiosensitivity, in that vegetative tissue is less sensitive than reproductive tissue (Underbrink & Pond 1976). Also, many perennating organs, such as rhizomes, bulbs, tubers and stolons, are shielded by growing underground. Moreover, these organs generally undergo a period of dormancy when sensitivity is presumably decreased, as it is in dormant woody plants.

Among the most important of experimental variables are exposure rate and exposure duration. Generally, a lower rate and longer time for a given total exposure have a lesser effect than the same total exposure given for a shorter time at a higher rate. Also, dose fractionation usually reduces the effect of a given total exposure. These and other experimental variables are considered in greater detail by Sparrow (1961), Sparrow, Cuany, Miksche & Schairer (1961) and Sparrow, Schwemmer & Bottino (1971). These authors also discuss various environmental variables which may affect radiosensitivity. The considerable effect of temperature on radiosensitivity is discussed by Sparrow, Schwemmer & Bottino (1973). They note that an increase in temperature after irradiation may reduce survival by as much as 50 percent, and will also result in a shorter period of elapsed time before plant death occurs. Conversely, decreased postirradiation temperature results in longer survival time, so that too-early scoring would give a false indication of radioresistance.

It is obvious that in determining or predicting plant radiosensitivity one must take into consideration the large number of relevant variables. Therefore one would be well-advised to consult the appropriate sources for more detailed information and discussion. Of particular value for a general overview of existing work on plant radiosensitivity are the reviews by Sparrow, Sparrow, Thompson & Schairer (1965); Sparrow, Schwemmer & Bottino (1971); Sparrow & Schwemmer (1974); and Underbrink & Pond (1976).

6. Author's note

Just prior to his untimely death, Dr. Arnold H. Sparrow had been asked to write this chapter. The present author, one of his long-time laboratory associates, is acting as his surrogate in this task. Nearly all of the body of data presented here was produced in his laboratory, through a prolonged community of effort. Countless colleagues, assistants and students have contributed, but the preponderance of data were generated by his regular staff, whose extraordinary loyalty assured continuity and consistency over the years. Therefore, since we were all cogs in the same wheel, it seems appropriate to acknowledge the contributions of his other long term associates, the more so since

together we put nearly 200 human-years of effort into Dr. Sparrow's now-ended radiobiological research.

On the technical staff, Rhoda C. Sparrow, his wife, worked with him for 29 years, Virginia Pond 28 years, Lloyd A. Schairer 23 years, Anne F. Nauman 17 years, E. Eric Klug 14 years, Susan S. Schwemmer 12 years, Richard C. Sautkulis 10 years, Marta M. Nawrocky 10 years; collaborators Dr. Alan G. Underbrink and Dr. Charles H. Nauman both 11 years; secretary Harriot Barry 14 years; and statistical consultant Keith H. Thompson 14 years.

7. References

1. Baetcke, K. P., Sparow, A. H., Nauman, C. H. and Schwemmer, S. S. 1967. The relationship of DNA content to nuclear and chromosome volumes and to radiosensitivity (LD₅₀). *Proceedings of the National Academy of Sciences, U.S.A.*, 58, 533-540.
2. Bennett, M. D. 1972. Nuclear DNA content and minimum generation time in herbaceous plants. *Proceedings of the Royal Society of London B*, 181, 109-135.
3. Bennett, M.D. and Smith, J. B. 1976. Nuclear DNA amounts in angiosperms. *Philosophical Transactions of the Royal Society of London B*, 274, 227-274.
4. Bottino, P. J. and Boreš, R. J. 1973. Relative biological effectiveness (RBE) of beta-, gamma- and x-irradiation for seedling growth and survival in barley and somatic mutations in Tradescantia. (unpublished).
5. Bottino, P. J. and Sparrow, A. H. 1971a. Comparison of the effects of simulated fallout decay and constant exposure-rate gamma-ray treatments on the survival and yield of wheat and oats. *Radiation Botany* 11, 405-410.
6. Bottino, P. J. and Sparrow, A. H. 1971b. The effects of exposure time and rate on the survival and yield of lettuce, barley and wheat. *Radiation Botany* 11, 147-156.
7. Bowen, H. J. M. 1962. Radiosensitivity in higher plants, and correlations with cell weight and DNA content. *Radiation Botany* 1, 223-228.
8. Bowen, H. J. M. and Smith, S. R. 1959. Effect of gamma-radiation on weeds. *Nature* 183, 907.
9. Caldecott, R. S. 1961. Seedling height, oxygen availability, storage and temperature: their relation to radiation-induced genetic and seedling injury in barley. Effects of Ionizing Radiations on Seeds, International Atomic Energy Agency, Vienna.
10. Capella, J. A. and Conger, A. D. 1967. Radiosensitivity and interphase chromosome volume in the gymnosperms. *Radiation Botany* 7, 137-149.
11. Conger, A. D. 1970. The relation of interphase chromosome volume (ICV) to an estimated 'actual chromosome volume'. *International Journal of Radiation Biology* 17, 381-384.

12. Conger, A. D., Sparrow, A. H., Schwemmer, S. S., and Klug, E. E. 1979. Relation of nuclear volume and radiosensitivity to ploidy level (haploid to 22-ploid) in higher plants and yeast. Radiation Research, in preparation.
13. Darlington, C. D. and La Cour, L. F. 1975. The Handling of Chromosomes, 6th edition. George Allen and Unwin Ltd., New York.
14. Donini, B., Sparrow, A. H., Schairer, L. A. and Sparrow, R. C. 1967. The relative biological efficiency of gamma rays and fission neutrons in plant species with different nuclear and chromosome volumes. Radiation Research 32, 692-705.
15. El-Lakany, M. H., and Sziklai, O. 1970a. Effects of gamma-irradiation on some western conifers. Radiation Botany 10, 411-420.
16. El-Lakany, M. H., and Sziklai, O. 1970b. Variation in nuclear characteristics in selected western conifers and its relation to radiosensitivity. Radiation Botany 10, 421-427.
17. Evans, H. J. and Sparrow, A. H. 1961. Nuclear factors affecting radiosensitivity. II. Dependence on nuclear and chromosome structure and organization. Brookhaven Symposia in Biology 14, 101-127.
18. Fujii, T. and Matsumura, S. 1958. Radiosensitivity in plants. I. Determination of LD-50 in cultivated plants. (Preliminary report). Japanese Journal of Genetics 33, 389-397.
19. Gómez-Campo, C. and Delgado, L. 1964. Radioresistance in crucifers. Radiation Botany 4, 479-483.
20. Gunckel, J. E. and Sparrow, A. H. 1961. Ionizing radiations: biochemical, physiological and morphological aspects of their effects on plants. In: Encyclopedia of Plant Physiology, Vol. 16, pp. 555-611.
21. Gustaffson, A. and von Wettstein, D. 1958. Mutationen und Mutationszüchtung. Handbuch der Pflanzenzüchtung 1, 612-699.
22. Ichikawa, S. 1970. Polyploidy and radiosensitivity in higher plants. Gamma Field Symposia 9, 1-17.
23. Johnstone, G. R. and Klepinger, F. W. 1967. The effects of gamma radiation on germination and seedling development of Yucca brevifolia Engelm. Radiation Botany 7, 385-388.
24. Kaufman, G. E. and Miller, M. W. 1970. A statistical evaluation of Sparrow et al.'s relationship of D_0 to chromosome volume. Radiation Research 42, 181-187.

25. Kraus, M. P. 1969. Resistance of blue-green algae to ^{60}Co gamma radiation. *Radiation Botany* 9, 481-489.
26. Miksche, J. P. and Rudolph, T. D. 1968. Use of nuclear variables to investigate radiosensitivity of gymnosperm seed. *Radiation Botany* 8, 187-192.
27. Miller, M. W. 1970. The radiosensitivity of three pairs of diploid and tetraploid plant species: correlation between nuclear and chromosomal volume, Roentgen exposure and energy absorption per chromosome. *Radiation Botany* 10, 273-279.
28. Miller, M. W. and Sparrow, A. H. 1965. The radiosensitivity of thalli of Marchantia polymorpha L. to acute gamma irradiation. *Radiation Botany* 5, 567-580.
29. Miller, M. W., Sparrow, A. H. and Rogers, A. F. 1965. The radiosensitivity of gemmae of Marchantia polymorpha L. to acute gamma irradiation. *The Bryologist* 68, 31-47.
30. Nirula, S. 1963. Studies on some nuclear factors controlling radiation sensitivity and the induced mutation rate in Eu-Para-Sorghum species. *Radiation Botany* 3, 351-361.
31. Osborne, T. S. and Constantin, M. J. 1966. Sensitivity to ionizing radiation: dormant seeds. In: Environmental Biology, P. L. Altman and D. S. Dittmer, eds., Federation of American Societies for Experimental Biology, Bethesda, Maryland, U.S.A., pp. 183-190.
32. Osborne, T. S. and Lunden, A. O. 1961. The cooperative plant and seed irradiation program of the University of Tennessee. *International Journal of Applied Radiation and Isotopes* 10, 198-209.
33. Osborne, T. S. and Lunden, A. O. 1964. Seed radiosensitivity: a new constant? *Science* 145, 710-711.
34. Posner, H. B. and Sparrow, A. H. 1964. Survival of Chlorella and Chlamydomonas after acute and chronic gamma radiation. *Radiation Botany* 4, 253-257.
35. Price, H. J., Sparrow, A. H. and Nauman, A. F. 1973. Correlations between nuclear volume, cell volume and DNA content in meristematic cells of herbaceous angiosperms. *Experientia* 29, 1028-1029.
36. Rudolph, T. D. 1971. Gymnosperm seedling sensitivity to gamma radiation: its relation to seed radiosensitivity and nuclear variables. *Radiation Botany* 11, 45-51.

37. Rudolph, T. D. and Miksche, J. P. 1970. The relative sensitivity of the soaked seeds of nine gymnosperm species to gamma radiation. *Radiation Botany* 10, 401-409.
38. Sass, J. E. 1958. Botanical Microtechnique, 3rd edition. Iowa State University Press, Ames, Iowa, U.S.A.
39. Sparrow, A. H. 1960. Uses of large sources of ionizing radiation in botanical research and some possible practical applications. In: Large Radiation Sources in Industry, Vol. 2. International Atomic Energy Agency, Vienna. pp. 195-219.
40. Sparrow, A. H. 1961. Types of ionizing radiation and their cytogenetic effects. In: Mutation and Plant Breeding, Publ. no. 891, National Academy of Sciences - National Research Council, Washington, D.C., U.S.A., pp. 55-119.
41. Sparrow, A. H. 1962. The role of the cell nucleus in determining radiosensitivity. Brookhaven Lecture Series No. 17, Brookhaven National Laboratory, Upton, New York, U.S.A. BNL 766 (T-287). 29 pp.
42. Sparrow, A. H. 1965a. Comparisons of the tolerances of higher plant species to acute and chronic exposures of ionizing radiation. *Japanese Journal of Genetics* 40, Supplement, 12-37.
43. Sparrow, A. H. 1965b. Relationship between chromosome volume and radiation sensitivity in plant cells. In: Cellular Radiation Biology. The Williams and Wilkins Company, Baltimore, Maryland, U.S.A., pp. 199-222.
44. Sparrow, A. H. 1966. Research uses of the gamma field and related radiation facilities at Brookhaven National Laboratory. *Radiation Botany* 6, 377-405.
45. Sparrow, A. H., Baetcke, K. P., Shaver, D. L. and Pond, V. 1968. The relationship of mutation rate per roentgen to DNA content per chromosome and to interphase chromosome volume. *Genetics* 59, 65-78.
46. Sparrow, A. H., Binnington, J. P. and Pond, V. 1958. Bibliography on the effects of ionizing radiations on plants, 1896-1955. Brookhaven National Laboratory, Upton, New York, U.S.A., BNL 504 (L-103), 222 pp.
47. Sparrow, A. H. and Christensen, E. 1953. Tolerance of certain higher plants to chronic exposure to gamma radiation from Cobalt-60. *Science* 118, 697-698.

48. Sparrow, A. H., Cuany, R. L., Miksche, J. P. and Schairer, L. A. 1961. Some factors affecting the responses of plants to acute and chronic radiation exposures. *Radiation Botany* 1, 10-34.
49. Sparrow, A. H. and Evans, H. J. 1961. Nuclear factors affecting radiosensitivity. I. The influence of nuclear size and structure, chromosome complement, and DNA content. *Brookhaven Symposia in Biology* 14, 76-100.
50. Sparrow, A. H., Floyd, B. and Bottino, P. J. 1970. Effects of simulated radioactive fallout buildup and decay on survival and yield of lettuce, maize, radish, squash and tomato. *Radiation Botany* 10, 445-455.
51. Sparrow, A. H. and Gunckel, J. E. 1956. The effects on plants of chronic exposure to gamma radiation from radiocobalt. *Proceedings of the International Conference on the Peaceful Uses of Atomic Energy* 12, 52-59.
52. Sparrow, A. H., Howard, A., Cowie, F. G., Schwemmer, S. S. and Nauman, A. F. 1975. Chromosomes and cellular radiosensitivity. IV. A new radiotaxon represented by the ferns. *International Journal of Radiation Biology* 27, 343-354.
53. Sparrow, A. H. and Konzak, C. F. 1958. The use of ionizing radiation in plant breeding: accomplishments and prospects. In: *Camellia Culture*, E. C. Tourjé, ed. The Macmillan Company, New York, pp. 425-452.
54. Sparrow, A. H. and Miksche, J. P. 1961. Correlation of nuclear volume and DNA content with higher plant tolerance to chronic radiation. *Science* 134, 282-283.
55. Sparrow, A. H. and Nauman, A. F. 1973. Evolutionary changes in genome and chromosome sizes and in DNA content in the grasses. *Brookhaven Symposia in Biology* 25, 367-389.
56. Sparrow, A. H. and Nauman, A. F. 1976. Evolution of genome size by DNA doublings. *Science* 192, 524-529.
57. Sparrow, A. H., Price, H. J. and Underbrink, A. G. 1972. A survey of DNA content per cell and per chromosome of prokaryotic and eukaryotic organisms: some evolutionary considerations. *Brookhaven Symposia in Biology* 23, 451-494.
58. Sparrow, A. H. and Puglielli, L. 1969. Effects of simulated radioactive fallout decay on growth and yield of cabbage, maize, peas and radish. *Radiation Botany* 9, 77-92.

59. Sparrow, A. H., Rogers, A. F. and Schwemmer, S. S. 1968. Radiosensitivity studies with woody plants. I. Acute gamma irradiation survival data for 28 species and predictions for 190 species. *Radiation Botany* 8, 149-186.
60. Sparrow, A. H., Schairer, L. A. and Sparrow, R. C. 1963. Relationship between nuclear volumes, chromosome numbers, and relative radiosensitivities. *Science* 141, 163-166.
61. Sparrow, A. H. and Schwemmer, S. S. 1974. Correlations between nuclear characteristics, growth inhibition, and survival-curve parameters (LD_{50} , whole plant D_0 and D_q) for whole-plant acute gamma-irradiation of herbaceous species. *International Journal of Radiation Biology* 25, 565-581.
62. Sparrow, A. H., Schwemmer, S. S. and Bottino, P. J. 1971. The effects of external gamma radiation from radioactive fallout on plants with special reference to crop production. *Radiation Botany* 11, 85-118.
63. Sparrow, A. H., Schwemmer, S. S. and Bottino, P. J. 1973. Influence of dose, environmental conditions and nuclear volume on survival times in several gamma-irradiated plant species. *International Journal of Radiation Biology* 24, 377-388.
64. Sparrow, A. H., Schwemmer, S. S., Klug, E. E. and Puglielli, L. 1970a. Radiosensitivity studies with woody plants. II. Survival data for 13 species irradiated chronically for up to 8 years. *Radiation Research* 44, 154-177.
65. Sparrow, A. H., Schwemmer, S. S., Klug, E. E. and Puglielli, L. 1970b. Woody plants: changes in survival in response to long-term (8 years) chronic gamma irradiation. *Science* 169, 1082-1084.
66. Sparrow, A. H., Sparrow, R. C., Thompson, K. H. and Schairer, L. A. 1965. The use of nuclear and chromosomal variables in determining and predicting radiosensitivities. *Radiation Botany* 5, Supplement, 101-132.
67. Sparrow, A. H., Underbrink, A. G. and Rossi, H. H. 1972. Mutations induced in *Tradescantia* by small doses of x-rays and neutrons: analysis of dose-response curves. *Science* 176, 916-918.
68. Sparrow, A. H., Underbrink, A. G. and Sparrow, R. C. 1967. Chromosomes and cellular radiosensitivity. I. The relationship of D_0 to chromosome volume and complexity in seventy-nine different organisms. *Radiation Research* 32, 915-945.
69. Sparrow, A. H. and Woodwell, G. M. 1962. Prediction of sensitivity of plants to chronic gamma irradiation. *Radiation Botany* 2, 9-26.

70. Sparrow, R. C. and Sparrow, A. H. 1965. Relative radiosensitivities of woody and herbaceous spermatophytes. *Science* 147, 1499-1451.
71. Stairs, G. R. 1963. Acute gamma irradiation of Quercus seed. *Silvae Genetica* 12, 192-200.
72. Taylor, F. G., Jr. 1966. Predicted seasonal radiosensitivity of southern tree species. *Radiation Botany* 6, 307-311.
73. Underbrink, A. G. and Pond, V. 1976. Cytological factors and their predictive role in comparative radiosensitivity: a general summary. *Current Topics in Radiation Research Quarterly* 11, 251-306.
74. Underbrink, A. G., Schairer, L. A. and Sparrow, A. H. 1973. Tradescantia stamen hairs: a radiobiological test system applicable to chemical mutagenesis. In: Chemical mutagens: Principles and methods for their detection, Vol. 3, A. Hollaender, ed. Plenum Press, New York, pp. 171-207.
75. Underbrink, A. G., Sparrow, A. H., Pond, V., Takahashi, C. S. and Kappas, A. 1973. Radiation-induced pollen abortion in several commelinaceous taxa: its relation to chromosomal parameters. *Radiation Botany* 13, 215-227.
76. U. S. National Bureau of Standards Handbook 85. 1962. Physical Aspects of Irradiation. ICRU Report 10b.
77. Van't Hof, J. 1975. The duration of chromosomal DNA synthesis, of the mitotic cycle, and of meiosis of higher plants. In: Handbook of Genetics, Vol. 2, R. C. King, ed. Plenum Press, New York, pp. 363-377.
78. Woodwell, G. M. and Gannutz, T. P. 1967. Effects of chronic gamma irradiation on lichen communities of a forest. *American Journal of Botany* 54, 1210-1215.
79. Woodwell, G. M. and Rebuck, A. L. 1967. Effects of chronic gamma radiation on the structure and diversity of an oak-pine forest. *Ecological Monographs* 37, 53-69.
80. Woodwell, G. M. and Sparrow, A. H. 1963. Predicted and observed effects of chronic gamma radiation on a near-climax forest ecosystem. *Radiation Botany* 3, 231-237.
81. Woodwell, G. M. and Sparrow, A. H. 1965. Effects of ionizing radiation on ecological systems. In: *Ecological Effects of Nuclear War*, G. M. Woodwell, ed. BNL 917 (C-43), Brookhaven National Laboratory, Upton, New York, U.S.A. pp. 20-38.

82. Woodwell, G. M. and Whittaker, R. H. 1968. Effects of chronic gamma irradiation on plant communities. Quarterly Review of Biology, 43 42-55.
83. Yamagata, H., Kowyama, Y. and Syakudo, K. 1969. Radiosensitivity and polyploidy in some non-tuber bearing Solanum species. Radiation Botany 9, 509-521.
84. Yamakawa, K. and Sparrow, A. H. 1965. Correlation of interphase chromosome volume and reduction of viable seed set by chronic irradiation of 21 cultivated plants during reproductive stages. Radiation Botany 5, 557-566.
85. Yamakawa, K. and Sparrow, A. H. 1966. The correlation of interphase chromosome volume with pollen abortion induced by chronic gamma irradiation. Radiation Botany 6, 21-38.

8. Appendix

(a) Methods for determining nuclear factors used in prediction of plant radiosensitivity

Although chromosome volume is the basis for predictions of radiosensitivities, the parameters actually determined in the laboratory are nuclear volume and chromosome number, ICV being calculated by dividing the former by the latter. Methods for nuclear volume determination have been published previously (Sparrow, Rogers & Schwemmer 1968) but will be presented here in greater detail.

From 3 to 12 meristems are fixed in Craff III, a modified Nawashin fixative (see Sass 1958), as soon as possible after removal from the plant, keeping the plant material moist if delay before fixation is unavoidable. Root tips, about 5 mm in length, are best obtained from potted plants or from rooted cuttings. Shoot tips are dissected down by cutting or peeling away bud scales and leaf primordia until the apex is nearly exposed. This trimming down is especially important in buds which are waxy, resinous, hairy, fibrous or woody. Woody plants, particularly the resinous gymnosperms, must have all bud scales removed to assure proper penetration of the fixative. After dissection the shoot tip should not exceed about 5 mm in length and 2-3 mm in thickness. Samples are gently evacuated as soon as possible after fixation, until they sink in the fixative. If buds have a waxy coating which inhibits fixative penetration, a very small drop of liquid detergent will usually cause them to sink. Samples should be fixed overnight, but may be left in the fixative almost indefinitely.

Great care must be taken to omit flower buds or buds which have begun floral transition. This may be evidenced by elongation of internodes or by changes in the shape of the apex as observed microscopically. It is preferable to take shoots from seedlings after development of their second true leaves, or from actively-growing mature plants.

Dehydration is accomplished through an ethanol and tertiary butyl alcohol (TBA) series, as described by Sass (1958), with dry safranin added to the last ethanol-TBA mixture as a pre-stain to aid in tissue orientation during embedding and sectioning. Samples are embedded in paraffin with a 56-58°C melting point. Cardboard pillboxes are convenient for embedding and provide a uniformly flat surface for precise alignment of samples.

Sectioning is done longitudinally at 8 μ m unless plants are known to have very large or very small nuclei, when 10 μ m or 6 μ m would be more appropriate. Disposable microtome knives have been found to be quite satisfactory, as they are usable for a considerable number of samples, and they eliminate almost entirely the problem of static electricity. Sections are mounted serially

on slides which have been "subbed" by coating with a thin layer of gelatine (see Darlington & La Cour 1975), stained with safranin and fast green, and mounted in Permount.

In each of at least three samples, median longitudinal sections of the apex are located. Ten interphase nuclei are measured from the outer layer of the shoot apex, excluding the flanks where differentiation is occurring. In roots, cells are measured in the center of the meristematic region. In selecting nuclei to be measured, one should avoid those which are disproportionately large and thus may be in G2 with a 4C DNA amount. Using an ocular micrometer at 800x magnification, measurements are made in two perpendicular diameters, using major and minor axes where the nucleus deviates from a sphere. These measurements are converted to microns and averaged, and volumes are computed for each nucleus using the formula $V = d^3/6$ where d = the mean diameter. It has been determined that small deviations from a spherical shape do not result in significantly different volumes when applying this formula rather than the formula for a prolate spheroid. Volumes of at least 30 nuclei are averaged for each determination. If dormant woody plants must be used, the nuclear volume should be multiplied by 1.5 to compensate for seasonal variation in nuclear size (see text).

Chromosome numbers are determined from root tips, although in a few cases it has been necessary to use developing leaves or actively-growing shoot tips. Samples are pre-treated in a saturated solution of α -bromonaphthalene for 3 hr to arrest cells in metaphase, hydrolyzed for 12 min in 1N HCl at 60°C, stained by the Feulgen leuco-basic fuchsin method (see Darlington & La Cour 1975) for about one hour, and squashed. Slides are made permanent using the Conger-Fairchild quick-freezing method (Darlington & La Cour 1975) and mounted in Euparal.

(b) Glossary

Absorbed dose - The quantity of energy imparted to a unit mass of material exposed to ionizing radiation, expressed in rad.

Acute exposure - A radiation exposure of relatively short duration (minutes to hours), usually at a relatively high exposure rate. Not clearly distinguished from chronic exposure (q.v.), but sometimes considered to have a duration of no more than one mitotic cycle.

Basic number - the number of chromosomes in a single chromosome set, generally the lowest known haploid number in a series within a given taxon. Indicated by x (a diploid species is $2x$, a tetraploid $4x$, et. seq.). See n .

Chronic exposure - A radiation exposure of relatively long duration (days to weeks or years) at a relatively low exposure rate. See acute exposure.

D₀ - The radiation dose that, on the exponential portion of a survival curve, reduces survival by 63%. Generally used only for single-cell systems, but see Sparrow & Schwemmer (1974) for whole-plant D₀. Indicates the dose necessary to produce an average of one hit per target.

D_n - A measure of shoulder width on a survival curve. The point at which the exponential portion of the curve, extrapolated upwards, intersects 100% survival.

Dose - See absorbed dose; exposure.

Dose rate - Energy absorption per unit of time, expressed in rad. Often used inaccurately to indicate exposure rate.

Energy absorption per chromosome (E/Ch) - A calculated quantity based on 34 eV per ion pair (corrected from the earlier estimate of 32.5 eV) and 1.77 ionizations per μm^3 of wet tissue per R. It may be expressed by the formula $E/\text{Ch} = \text{ICV} \times \text{LD}_n \times 60.2$, where ICV = chromosomal volume in μm^3 , LD_n = exposure in R required for a given end point, and $60.2 = 34 \text{ eV} \times 1.77 \text{ ionizations per unit volume per R}$.

Exposure - A measure of X or gamma radiation based upon its ability to produce ionizations in air, expressed in R.

Exposure rate - the accumulation of X or gamma rays delivered in a unit of time, expressed as R/min, R/hr, etc.

FDS - Fallout decay simulation. See text.

Genome - A single basic chromosome complement. The number of chromosomes in a genome is determined by dividing the somatic chromosome number by ploidy level.

Genome volume (GV) - The volume of a single genome for a given species, expressed in μm^3 . Estimated by dividing nuclear volume by ploidy level.

ICV - Average interphase chromosome volume, expressed in μm^3 . A conceptual rather than an actual value, it is estimated by dividing meristematic nuclear volume by somatic chromosome number, assuming all chromosomes in a complement to be the same size.

Ionizing radiations - Radiations which have the ability to produce ionizations (ions pairs) when they interact with matter. They may be electro-magnetic (X rays, gamma rays) or particulate (alpha or beta particles, neutrons, protons, electrons). Ultra-violet rays are ionizing at only a few wavelengths, so are considered to be nonionizing.

LD_n - The exposure required to reduce plant survival by n percent from control values, generally expressed in R.

n - The gametic or haploid chromosome number of a species, regardless of basic number. The somatic number is $2n$, regardless of ploidy level.

Nuclear volume - As used here, the average volume of nuclei measured from histological preparations of either the shoot or root meristem, expressed in μm^3 .

R (Roentgen) - That quantity of X or gamma radiation such that the associated corpuscular emissions for 0.001293 g of air produces, in air, ions carrying 1 esu of electricity of either sign. May also be defined as the quantity of X or gamma radiation that produces 2.082×10^9 ion pairs per cc of air at 0°C and 760 mm Hg. The energy dissipated by 1 R is about 86.9 ergs per g of air.

rad - Radiation absorbed dose. The absorbed dose of any ionizing radiation that is accompanied by the liberation of 100 ergs of energy per g of absorbing material.

Figure Legends

n Fig. 1. Relationship of 3C DNA content to nuclear volume of 123 species of herbaceous higher plants. Correlation coefficient = 0.893. DNA values from Bennett & Smith (1976).

Fig. 2. Survival curve, showing method of determining LD_n , D_0 , (----) and D_q (— — —). See text for detailed explanation.

Fig. 3. Relationship of exposure for whole-plant D_0 ($D_{0w.p.}$) and whole-plant D_q ($D_{qw.p.}$) to interphase chromosome volume and estimated DNA per chromosome in 12 species of herbaceous plants. Slopes = -1. Adapted from Sparrow & Schwemmer (1974).

Fig. 4. Relationship of DNA content per cell to nuclear volume (a) and of DNA content per chromosome to interphase chromosome volume (b) for 30 species of herbaceous plants. Slopes = +1. Adapted from Baetcke, Sparrow, Nauman & Schwemmer (1967).

Fig. 5. Relationship of LD_{50} exposure to DNA per chromosome (a) and to interphase chromosome volume (b) for 10 species of herbaceous plants. Slopes = -1. Adapted from Baetcke, Sparrow, Nauman & Schwemmer (1967).

Fig. 6. Composite of regressions of exposure required to produce LD_{10} , LD_{50} , LD_{90} and LD_{100} plotted against interphase chromosome volume and estimated DNA per chromosome for acute (16-hr) exposures of 32 species of herbaceous plants to gamma irradiation. All slopes = -1. Adapted from Sparrow & Schwemmer (1974).

Fig. 7. Relationship of daily chronic exposure in R to interphase chromosome volume and estimated DNA per chromosome for 4 end points for herbaceous plant species. All slopes = -1. Adapted from Yamakawa & Sparrow (1965).

Fig. 8. Composite of regressions of chronic exposures (average R/day and accumulated kR for 3-yr exposures) required to produce various end points in woody plants plotted against interphase chromosome volume and estimated DNA per chromosome. Slight (SLGI) and severe (SGI) growth inhibition data (dashed lines) are for 1-yr exposures. All slopes = -1. Adapted from Sparrow, Schwemmer, Klug & Puglielli (1970a).

Fig. 9. Composite of regressions of acute exposure required to produce LD_{10} , LD_{50} , LD_{90} and LD_{100} in woody plants plotted against interphase chromosome volume and estimated DNA per chromosome. All slopes adjusted to mean of -0.73. Adapted from Sparrow, Rogers & Schwemmer (1968).

Fig. 10. Composite of regressions of exposure (chronic, acute and accumulated) plotted against interphase chromosome volume and estimated DNA per chromosome for various survival end points. All slopes = -1 except for the two regressions for acutely-irradiated woody species. Adapted from Underbrink & Pond (1974).

Fig. 1

Fig. 2

Fig. 3

Fig. 5

Fig. 6

Fig. 7

Fig. 9

Fig. 10

Table 1

Experimentally-determined Radiosensitivities of 281 species of herbaceous plants

Species	IC ₅₀ ^a (μm ³)	Whole-plant irradiations ^b				Chronic (R/day)			Acute seed irradiations (kR) ^d				Reference (see key) ^e
		Acute (kR)				Severe effect ^c	50% seed set	Lethal	50% germination	50% seedling dry wt.	50% seedling survival	50% seedling height	
		LD ₁₀	LD ₅₀	LD ₉₀	LD ₁₀₀								
1 <i>Aethionema saxatile</i>									375		75		1
2 <i>Allium cepa</i>	56.3					401-800				13.0			2,3
3 <i>A. cepa</i> cv. Excel	39.3					150							4
4 <i>A. cepa</i> cv. Yamaguchi-kohdaka	38.2						18						5
5 <i>A. cepa</i> cv. Yellow Sweet Spanish	45.6	2.50	2.90	3.18	3.50								6
6 <i>A. fistulosum</i> cv. Kujyo	29.5							23					5
7 <i>A. sativum</i>	33.3	0.93	1.12	1.66									7
8 <i>Aloe brevifolia</i>	65.5	2.27											7
9 <i>Alopecurus agrestis</i>											20.0		8
10 <i>A. myosuroides</i>											20.0		9
11 <i>Althaea rosea</i>	3.90					401-800			200		60		1
12 <i>Alyssum argenteum</i>									250		65		1
13 <i>A. saxatile</i>		5.51	8.97	18.44									7
14 <i>Ananas comosus</i>													4
15 <i>Anacyclus officinarum</i>	11.0				3.50								4
16 <i>Anethum graveolens</i>	6.0					750		2000					4
17 <i>Anisantha sterilis</i>											5.0		8
18 <i>Anthemis arvensis</i>											20.0		8
19 <i>Antirrhinum majus</i>	3.0					475							4
20 <i>Aphanostephus skirrhobasis</i>	11.2				8.00			1250					4
21 <i>Apium graveolens</i> var. dulce cv. Cornell 619	7.2						50						5
22 <i>Arabis alpina</i>									200		85		1
23 <i>Arabidopsis thaliana</i>	2.9		30.30		100.00	4000			>400		240		1,4,10,11
24 <i>Arachis hypogaea</i>	6.2									29.3	10,70		2,12,13
25 <i>Atriplex patula</i>											10.0		9
26 <i>Avena fatua</i>											18.0		9
27 <i>A. ludoviciana</i>											18.0		9
28 <i>A. sativa</i>	19.7	3.24	4.10	4.96							17-27	15-20	12,14,15
29 <i>Aubrieta deltoidea</i>									150		45		1
30 <i>Barbarea praecox</i>									400		60		1
31 <i>Beta vulgaris</i> var. cicla	6.2						130						5
32 <i>Biscutella leucocarpa</i>									>400		100		1
33 <i>Brassica barrelleri</i>									300		70		1
34 <i>B. juncea</i>	3.0								1300		240		1
35 <i>B. napobrassica</i>	4.3											>100	15
36 <i>B. napus</i>	3.3								350	142.2	130	25-35	1,2,15
37 <i>B. nigra</i>	4.3								220		90,115.5		1,9

Table 1 (cont.)

Species	ICV ^a (μm ³)	Whole-plant irradiations ^b						Acute seed irradiations (kR) ^d				Reference (see key) ^e	
		Acute (kR)				Chronic (R/day)		50% germination	50% seedling dry wt.	50% seedling survival	50% seedling height		
		LD ₁₀	LD ₅₀	LD ₉₀	LD ₁₀₀	Severe effect ^c	50% seed set						Lethal
38 <i>B. oleracea</i>	3.7								250		65		1
39 <i>B. oleracea</i> var. <i>capitata</i>	6.0	13.40	15.10	18.10	21.00								6
40 <i>B. oleracea</i> var. <i>capitata</i> cv. Nozaki-natsumaki	5.8						50						5
41 <i>B. pekinensis</i> cv. Kenshin	4.3						60						5
42 <i>B. rapa</i>	3.0												
43 <i>Brodiaea bridgesii</i>	21.5					160			110		60		1
44 <i>Bromus sterilis</i>													4
45 <i>Bunias erucago</i>											10		9
46 <i>B. orientalis</i>									300		85		1
47 <i>Cajanus cajan</i>									300		60		1
48 <i>Calendula arvensis</i>											15		12
49 <i>Camelina alyssum</i>	1.8										70		13
50 <i>Canna generalis</i>						201-400			>400		150		1
51 <i>Cannabis sativa</i>													3
52 <i>Capsella bursa-pastoris</i>	2.1	48.00	58.00	63.50	70.00				400		170, 87.6	ca. 7	15
53 <i>Capsicum frutescens</i>	6.5					201-400					24		1, 6, 9
54 <i>C. frutescens</i> cv. California Wonder	6.5						110						3, 12
55 <i>Cardaria draba</i>													5
56 <i>Carrichtera vella</i>	3.2								350		130		1
57 <i>Celosia cristata</i>						401-800			400		80		1
58 <i>Cerastium vulgatum</i>													3
59 <i>Cheiranthus cheiri</i>											80		8
60 <i>Chenopodium album</i>	4.4					401-800			>400		225		1
61 <i>Chlorophytum elatum</i>	15.1				2.00			450			15.1		3, 9
62 <i>Chrysanthemum arcticum</i>	10.1				15.00	801-1600							4
63 <i>C. corymbosum</i>	15.0				4.50								3, 4
64 <i>C. fruticosum</i>	12.8					401-800							4
65 <i>C. lacustre</i>	11.3	6.49	7.80		9.00	801-1600							3
66 <i>C. nipponicum</i>	17.7	2.42	3.02	3.43	4.00	201-400						21, 1	3, 4, 7, 16
67 <i>C. segetum</i>													3, 6
68 <i>C. yezoense</i>	13.6	8.45	9.15	9.95	11.00	801-1600					26.2		9
69 <i>Citrullus vulgaris</i>	4.3												3, 6
70 <i>C. vulgaris</i> cv. Kohgyoku-midori	5.3						170				60		12
71 <i>Cochlearia officinalis</i>													5
72 <i>Coleus blumei</i>	4.5					201-400			250		70		1
73 <i>Conringia orientalis</i>													3
74 <i>Coronopus squamatus</i>									120		80		1
75 <i>Cosmos bipinnatus</i>						101-200			400		110		1
76 <i>Crambe hispanica</i>											70-100		3, 13
77 <i>Crepis capillaris</i>	10.6				3.75			700	300		120		1
78 <i>Cucumis melo</i> var. makuwa cv. Ohgon-nashi	6.3						270						4
79 <i>C. sativus</i>	8.4												5
80 <i>C. sativus</i> cv. Chyojitsu-ochiai	6.5						240			46.1	<20		2, 12
81 <i>Cucurbita maxima</i> cv. Tokyo-kabochiya	3.7						280						5

Table 1 (cont.)

Species	IC ₅₀ ^a (μM)	Whole-plant irradiations ^b				Chronic (R/day)			Acute seed irradiations (kR) ^d				Reference (see key) ^e
		Acute (kR)		Chronic (R/day)		Severe effect ^c	50% seed set	Lethal	50% germination	50% seedling dry wt.	50% seedling survival	50% seedling height	
		LD ₁₀	LD ₅₀	LD ₉₀	LD ₁₀₀								
82 <i>C. pepo</i> cv. Royal Acorn	2.5	4.17f	6.65f	9.14f									7
83 <i>Cyanotis somaliensis</i>	7.7	5.64											7
84 <i>Dactylis glomerata</i>	9.4												12
85 <i>Dahlia hybrida</i>						201-400					11		3
86 <i>Datura stramonium</i>						201-400							3
87 <i>Daucus carota</i>	6.3												3
88 <i>D. carota</i> var. <i>sativa</i> cv. Senkoh-sanzun	5.8						180			61.8			2
89 <i>Descurainia sophia</i>													5
90 <i>Digitaria sanguinalis</i>	2.6								350		110		1
91 <i>Diplotaxis muralis</i>						1601-6000							3
92 <i>Eruca sativa</i>	4.1								>400		190		1
93 <i>Erucastum gallicum</i>									800		130		1
94 <i>Erysimum cheiranthoides</i>									400		85		1
95 <i>Euphorbia helioscopia</i>									>400		100		1
96 <i>E. peplus</i>											42.0		9
97 <i>Festuca elatior</i>	10.4										16.8		9
98 <i>Fumaria officinalis</i>										14.0	19		2,12
99 <i>Galeopsis tetrahit</i>											5		9
100 <i>Galium aparine</i>											10.0		8
101 <i>Gladiolus</i> sp. cv. Friendship	4.6	25.00	32.10	39.20	n.r. ⁸			5000			40.0		9
102 <i>Glycine max</i>	4.0												4,6
103 <i>Gossypium arboreum</i>	16.7												
104 <i>G. hirsutum</i>	5.7					201-400				16.8	11,40-70	5-7	12,13,15
105 <i>Graptopetalum bartramii</i>	1.5					2000					21-29		2
106 <i>G. macdougalii</i>	1.1					1601-6000							3,12
107 <i>Haemanthus katherinae</i>	102.4	0.78	0.96	1.08	1.50								4
108 <i>Haworthia attenuata</i>	32.3												3
109 <i>H. fasciata</i>	48.1	1.57				150		400					6
110 <i>Helianthus annuus</i> cv. Mammoth Russian	10.4		6.00										4
111 <i>Heliophila amplexicaulis</i>						450		500				2-5	7
112 <i>H. longifolia</i>	2.5								150		85		4,10,15
113 <i>Hemerocallis</i> sp.									120		65		1
114 <i>Hesperis matronalis</i>	7.1										17		1
115 <i>Hibiscus cannabinus</i>	5.0	6.10	6.43	7.50	10.00				90		15		12
116 <i>Hirschfeldia adpressa</i>													1
117 <i>Holcus gayanus</i>	16.9				3.50				200		80		6
118 <i>Hordeum vulgare</i>	20.4	2.16											1
119 <i>H. vulgare</i> cv. Chikurin No. 1	18.8							25		25.9	13-20,70	12,10-15	4
120 <i>H. vulgare</i> cv. Himalaya	24.6	1.28	1.73	2.17									2,7,12,13,15,17
121 <i>H. vulgare</i> cv. Mari	18.0	1.74	1.91	2.20									5
122 <i>Hyacinthus orientalis</i> cv. Innocence	65.1				1.00								18
123 <i>Iberis sempervirens</i>													7,19
124 <i>Impatiens sultanii</i>	7.4								300		95		4
125 <i>Ipomoea noctiflora</i>						275							1
						401-800							4
													3

Table 1 (cont.)

Species	IC ₅₀ ^a (μm ³)	Whole-plant irradiations ^b							Acute seed irradiations (kR) ^d				Reference (see key) ^e
		Acute (kR)				Chronic (R/day)			50% germination	50% seedling dry wt.	50% seedling survival	50% seedling height	
		LD ₁₀	LD ₅₀	LD ₉₀	LD ₁₀₀	Severe effect ^c	50% seed set	Lethal					
126 <i>Isatis tinctoria</i>									600		65		1
127 <i>Kalanchoe blossfeldiana</i>						801-1600							3
128 <i>K. daigremontiana</i>	2.0	37.60	47.50	57.00	80.00	401-800							3,6
129 <i>K. X hybrida</i>	2.0	37.30	42.20	46.50	50.00								6
130 <i>K. tubifolia</i>						1601-6000							3
131 <i>Lactuca sativa</i>	8.5	6.51	6.91	7.52	8.40	401-800				47.3			2,3,6
132 <i>Lenophyllum pusillum</i>						801-1600							3
133 <i>L. texanum</i>						1601-6000							3
134 <i>Lespedeza cuneata</i>											37-46		12
135 <i>L. stipulacea</i>											<40		12
136 <i>Lilium longiflorum</i>	52.2				0.80	30-50							3,4
137 <i>L. superbum</i>	72.4	0.81	1.17	1.68	n.r.8								6
138 <i>Linum usitatissimum</i>	5.5					801-1600				71.3		40-50	2,3,15
139 <i>Lunaria annua</i>									180		45		1
140 <i>Lupinus angustifolius</i>											>40		12
141 <i>L. luteus</i>												10-15	15
142 <i>Luzula acuminata</i>						1601-6000							3
143 <i>L. multiflora</i>						1601-6000							3
144 <i>L. pallescens</i>						1601-6000							3
145 <i>L. purpurea</i>	24.2					300		375					4
146 <i>Lycopersicon esculentum</i>	6.7	11.20	13.30	15.30		401-800				47.5	13-37	30-40	2,3,7,12,15
147 <i>L. esculentum</i> cv. Shugyoku	7.4						85						5
148 <i>Malcolmia flexuosa</i>									350		75		1
149 <i>Matthiola incana</i>	5.5								350		25		1
150 <i>Medicago lupulina</i>											80		9
151 <i>M. orbicularis</i>											21		12
152 <i>M. sativa</i>	8.4										38-62		12
153 <i>Melilotus</i> sp.											59		12
154 <i>M. officinalis</i>						201-400							3
155 <i>Mentha spicata</i>	3.2				30.00								4
156 <i>Mirabilis jalapa</i>						201-400							3
157 <i>Mollugo verticillata</i>						801-1600							3
158 <i>Moricandia arvensis</i>									250		85		1
159 <i>Myagrum perfoliatum</i>									>400		140		1
160 <i>Nasturtium officinale</i>									175		45		1
161 <i>Nicotiana glauca</i>	5.9					201-400							3
162 <i>N. glauca</i>	5.8					255		400					4
163 <i>N. langsdorffii</i>	8.7					201-400							3
164 <i>N. rustica</i>	4.2					201-400							3
165 <i>Nigella damascena</i>	33.9	1.84	2.54	3.00	3.25								6
166 <i>Oryza sativa</i>	3.1										<15-42, 30-40		12,13
167 <i>O. sativa</i> cv. Nohrin No. 1	3.2						250						5
168 <i>Oxalis stricta</i>	4.7					450							4
169 <i>Papaver dubium</i>											20.0		9
170 <i>P. rhoeas</i>	11.1										13.3		9
171 <i>P. somniferum</i>												15	15
172 <i>Paspalum dilatatum</i>	2.9										>32		12
173 <i>Petunia hybrida</i> (2x)	8.7		3.50		9.00	401-800							3,20
174 <i>P. hybrida</i> (4x)	8.4		4.00		10.00								20
175 <i>Phalaris canariensis</i>											7.5		9

Table 1 (cont.)

Species	IC ₅₀ ^a (μM^3)	Whole-plant irradiations ^b										Acute seed irradiations (kR) ^d				Reference (see key) ^e
		Acute (kR)				Chronic (R/day)		Severe effect ^c	50% seed set	Lethal	50% germination	50% seedling dry wt.	50% seedling survival	50% seedling height		
		LD ₁₀	LD ₅₀	LD ₉₀	LD ₁₀₀											
176 <i>Pharbitis nil</i>	8.6															
177 <i>Phaseolus limensis</i> cv. Fordhook 242	6.9	5.45 ^f	6.21 ^f	6.98 ^f									70		13 7	
178 <i>P. vulgaris</i>	6.9					801-1600										
179 <i>P. vulgaris</i> cv. Kentucky Wonder	7.6						75							ca. 8	3,15 5	
180 <i>P. vulgaris</i> cv. Topcrop	8.7						55									
181 <i>Phytolacca decandra</i>						201-400									5	
182 <i>Pisum sativum</i>	20.4					201-400									3	
183 <i>P. sativum</i> cv. Alaska	23.2	2.30	3.40	4.70	6.00									5-15	3,15	
184 <i>P. sativum</i> cv. Alderman	23.8	2.93	3.75	4.25	5.00										6	
185 <i>P. sativum</i> cv. Oracle	15.1						60								6	
186 <i>P. sativum</i> cv. Witham Wonder	12.8					350		550							5 4	
187 <i>Plantago major</i>	7.6															
188 <i>Poa pratensis</i>												7.5			9	
189 <i>Podophyllum peltatum</i>	93.2				0.75			40						20	15	
190 <i>Polygonum aviculare</i>															4	
191 <i>P. convolvulus</i>												30.0			9	
192 <i>P. persicaria</i>												30.0			9	
193 <i>Raphanus raphanistrum</i>	3.7											5			9	
194 <i>R. sativus</i>	5.1											20.0			9	
195 <i>R. sativus</i> cv. Cherry Belle	5.6	16.80	19.00	21.60	n.r. ⁸				>400			210.70			1,13 6	
196 <i>R. sativus</i> cv. Nerima	5.2							40							5	
197 <i>R. sativus</i> cv. Scarlet Turnip	4.7					1200									4	
198 <i>Ricinus communis</i>	5.4					500		800								
199 <i>Rumex aquaticus</i>	3.9	10.32													4	
200 <i>R. confertus</i>	3.8	14.92													7	
201 <i>R. conglomeratus</i>	4.9	16.04													7	
202 <i>R. crispus</i>	3.4	19.90	21.30	22.70	24.60										7	
203 <i>R. hydrolapathum</i>	3.3	7.95										15.3			6,9	
204 <i>R. maritimus</i>	3.2	13.80	16.30	18.40	21.20										7	
205 <i>R. obtusifolius</i>	3.7	11.59													6	
206 <i>R. obtusifolius</i> var. <i>agrestis</i>	3.9	12.00	15.20	17.30	20.00							14.3			7,9 6	
207 <i>R. orbiculatus</i>	3.7	5.38														
208 <i>R. palustris</i>	3.6	13.04													7	
209 <i>R. pseudonatronatus</i>	4.5	16.30	18.20	19.50	20.00										7	
210 <i>R. pulcher</i>	5.4	11.00													6	
211 <i>R. sanguineus</i>	4.6	10.80	14.00	14.90	16.00										7	
212 <i>R. salicifolius</i> ssp. <i>triangulivalvis</i>	3.7	13.00	14.10	15.10	16.50										6 6	
213 <i>R. scutatus</i>	7.2	12.10	13.70	15.10	17.00											
214 <i>R. stenophyllus</i>	2.8	9.60	11.30	13.70	18.60										6	
215 <i>R. thyrsiflorus</i>	12.7	4.40	5.08	5.45	6.00										6	
216 <i>Saintpaulia ionantha</i>	3.6					350									6	
217 <i>Secale cereale</i>	21.2														4	
218 <i>Sedum acre</i>	1.9					801-1600						8-17		10-15	12,15 3	

100

Species	ICy ^a (μm ³)	Whole-plant irradiations ^b							Acute seed irradiations (kR) ^d				Reference (see key) ^e
		Acute (kR)				Chronic (R/day)			50% germination	50% seedling dry wt.	50% seedling survival	50% seedling height	
		LD ₁₀	LD ₅₀	LD ₉₀	LD ₁₀₀	Severe effect ^c	50% seed set	lethal					
219 <i>S. alzon</i>	2.4					401-800							3
220 <i>S. album</i>	0.7					801-1600							3
221 <i>S. alfredi</i> var. <i>nagasakianum</i>	0.6				50.00								4
222 <i>S. oryzifolium</i>	2.2				20.00	750		1000					4
223 <i>S. rupifragum</i>	0.5	15.00			75.00								4,7
224 <i>S. ternatum</i>	4.6				25.00								4
225 <i>S. tricarpum</i>	0.7				75.00								4
226 <i>Senecio vulgaris</i>	5.0												9
227 <i>Setaria italica</i>											14.7		12
228 <i>Sinapis alba</i>											14		1,9,15
229 <i>S. arvensis</i>									>400		150,88.5	>100	1,9
230 <i>Sisymbrium austriacum</i>									>400		240,66.8		1
231 <i>Solanum aviculare</i>	3.0								200		75		21
232 <i>S. gilo</i>												25	13
233 <i>S. melanocerasum</i>	4.8										20-40		21
234 <i>S. melongena</i> cv. <i>Shinkissin</i>	8.0						80					30	5
235 <i>S. nigrum</i> (4x)	5.2												9
236 <i>Sonchus asper</i>											9.1		9
237 <i>S. oleraceus</i>											31.0		9
238 <i>Sorghum bicolor</i>	5.4										10.9		9
239 <i>S. nitidum</i>	14.2										40		13
240 <i>S. vulgare</i>	9.6										16-26	25	22
241 <i>Spergula arvensis</i>											64-65, >40	35	12,22
242 <i>Spinacia oleracea</i> cv. Ujyo	10.8					90					31.5		9
243 <i>Spinacia oleracea</i> var. <i>inermis</i>	11.3	8.41 ^f	11.80 ^f	15.10 ^f									5
244 <i>Stellaria media</i>													7
245 <i>Succowia balearica</i>											38.3		9
246 <i>Tagetes erecta</i>	2.9		7.30		12.00				400		125		1
247 <i>T. patula</i>	2.9		6.40		14.00								20
248 <i>Thlaspi arvense</i>													20
249 <i>Tradescantia</i> sp. clone 02	52.8	1.10	1.57	1.77	2.00						11.5		9
250 <i>T. blossfeldiana</i>	7.5		10.20		12.00								6
251 <i>T. navicularis</i>	19.3	2.75	4.25	6.00	7.00								11,16
252 <i>T. ohlensis</i>	43.9					65							6
253 <i>T. paludosa</i> clone B2-2	54.8	1.35	1.44	1.60	2.00	50							4
254 <i>Trifolium incarnatum</i>	9.0												4,6
255 <i>T. pratense</i>	5.3									135.0		25->64	2,12
256 <i>T. repens</i> cv. <i>White Dutch</i>	4.4	21.10	24.30	26.80	30.00							35->108	12
257 <i>Trillium grandiflorum</i>	145.2				0.60	10		15					6
258 <i>Tripleurospermum maritimum</i>													4
259 <i>Trifolium aestivum</i>	15.8	3.70									7.5		9
260 <i>T. aestivum</i> cv. Indus	16.1	2.90	3.45	4.00									7
261 <i>T. aestivum</i> cv. Opal	15.0	4.63	5.11	5.59									7,19
262 <i>T. vulgare</i> (<i>T. aestivum</i>)	15.8												14
											14-25, 20-40	15-20	12,13,15

Species	ICV ^a (μm^3)	Whole-plant irradiations ^b							Acute seed irradiations (kR) ^d				Reference (see key) ^e
		Acute (kR)				Chronic (R/day)			50% germination	50% seedling dry wt.	50% seedling survival	50% seedling height	
		LD ₁₀	LD ₅₀	LD ₉₀	LD ₁₀₀	Severe effect ^c	50% seed set	Lethal					
263 <i>Tropaeolum majus</i>	5.9	9.00	11.50	13.70	15.00								6
264 <i>Tulbaghia violacea</i>	37.5					45		120					4
265 <i>Urtica urens</i>											37.0		9
266 <i>Veronica persica</i>											129.5		9
267 <i>V. polita</i>											104.7		9
268 <i>Vicia angustifolia</i>	12.7					201-400							3
269 <i>V. faba</i>	48.8	0.64	0.98	1.34	1.50	135		205					4,6
270 <i>V. tenuifolia</i>						201-400							3
271 <i>V. villosa</i>	11.6										17		12
272 <i>Vigna sinensis</i>	6.5										11,40-70		12,13
273 <i>Viola arvensis</i>											40.0		9
274 <i>Xanthium</i> sp.						401-800							3
275 <i>Yucca brevifolia</i>											53		23
276 <i>Zea mays</i>	14.5										>15,40		12,13
277 <i>Z. mays</i> cv. Golden Bantam	15.0	4.85	5.23	5.95	7.00	500		670					4,6
278 <i>Z. mays</i> hybrid	14.1	4.06 ^f	5.10	5.92 ^f									7,24
279 <i>Z. mays</i> X <i>Tripsacum dactyloides</i>											<10		12
280 <i>Zinnia elegans</i> (2x)	5.1		2.20		3.00								20
281 <i>Z. elegans</i> (4x)	3.2		7.20		15.00								20

^aIf ICV differs from that given in Table 5, the value given here was determined from experimental control plants, or was taken from the same source as sensitivity data.

^bWhen different values have been published by the same author(s), the most recently-published figures have been used here.

^cUsually expressed as severe growth inhibition.

^dData on additional end points and percentage of effect are tabulated by Osborne & Constantin (1966) and Fujii & Matsumura (1958).

^eReferences:

1. Gomez-Campo & Delgado (1964)	9. Bowen (1962)	17. Caldecott (1961)
2. Osborne & Lunden (1964)	10. Donini, Sparrow, Schairer & Sparrow (1967)	18. Bottino & Bores (1973)
3. Sparrow & Gunkel (1956)	11. Sparrow, Schwemmer & Bottino (1973)	19. Bottino & Sparrow (1971b)
4. Sparrow, Sparrow, Thompson & Schairer (1965)	12. Osborne & Lunden (1961)	20. Miller (1970)
5. Yamakawa & Sparrow (1965)	13. Fujii & Matsumura (1958)	21. Yamagata, Kowama & Syakudo (1969)
6. Sparrow & Schwemmer (1974)	14. Bottino & Sparrow (1971a)	22. Nirula (1963)
7. Sparrow, Schwemmer & Bottino (1971)	15. Gustaffson & von Wettstein (1958)	23. Johnstone & Klepinger (1967)
8. Bowen & Smith (1959)	16. Baetcke, Sparrow, Nauman & Schwemmer (1967)	24. Sparrow, Floyd & Bottino (1970)

^fSensitivity from FDS exposure (fallout decay simulation). Included only when other data not available.

^gLethal dose not reached.

Table 2

Experimentally-determined radiosensitivities of 62 species of woody plants

Species	IC ₅₀ ^a (m ³)	Whole-plant irradiations ^b											Seed irradiations (kR)			Reference (see key) ^e	
		Acute (kR)							Chronic (R/day)				50% germi- nation	50% sur- vival	50% dry weight ^d		
		LD ₁₀	LD ₅₀	LD ₉₀	LD ₁₀₀	Severe effect ^c	Slight effect ^c	LD ₁₀	LD ₅₀	LD ₉₀	LD ₁₀₀	Severe effect ^c					
1 <i>Abies balsamea</i>	46.4	0.43	0.89	1.36	1.50	0.60					18.0						1,2
2 <i>Acer rubrum</i>	6.5	2.87	5.11	7.36	8.00	6.00	4.50	62.0	130	198	205	101-200					1,2,3,4
3 <i>A. saccharum</i>	4.8	3.41	4.72	6.03	8.00	6.00	3.00	10.5	77.9	145	185						1,2,3
4 <i>A. spicatum</i>													101-200				4
5 <i>Betula lutea</i>	3.2	2.47	4.28	7.69	8.00	6.00	2.00	55.5	83.1	111	157						1,2,3
6 <i>Buddleia alternifolia</i>	2.2	3.39	7.05	10.72	9.00 ^e												1
7 <i>B. davidii</i>	0.9	15.18	17.50	19.82	20.00												
8 <i>Carica papaya</i>																	1
9 <i>Clematis virginiana</i>	16.0	1.31	1.89	2.47	2.70									12			5
10 <i>Coffea arabica</i>	3.9													<10			1
11 <i>Cornus florida</i>	6.9																5
12 <i>Fraxinus americana</i>	4.7	5.68	7.74	9.81	10.00	9.00	3.50	58.7	132	205	265	51-100					4
13 <i>Gaylussacia</i> sp.										70							1,2,3
14 <i>Juniperus conferta</i>	22.7		1.06	1.4													6
15 <i>J. virginiana</i>	18.8																7
16 <i>Kalmia latifolia</i>											30.0						2
17 <i>Larix laricina</i>	46.3	0.43	0.71	0.98	1.10								201-400				4
18 <i>L. leptolepis</i>	48.5	0.48	0.83	1.52	1.50 ^b	1.00	0.70	6.8	14.1	21.4	21.5		3.82	2.51	4.43		1,8,9
19 <i>Liriodendron tulipifera</i>	6.4												201-400				1,2,3
20 <i>Paeonia suffruticosa</i>	57.3	0.20	0.48	1.04	1.00 ^f												4
21 <i>Picea abies</i>	42.6	0.91	1.10	1.29	1.35												1
22 <i>P. glauca</i>	45.3	0.49	0.78	1.07	1.13	0.90	0.30	9.8	13.0	16.2	19.3		2.22	1, 1.38	2.11		1,8,9,10
23 <i>P. mariana</i>	33.1		0.648										3.19	2.99	3.07		1,2,3,8,9
24 <i>P. pungens</i>	40.7	0.96	1.19	1.42	1.50								4.06	3.34	5.58		8,9,11
25 <i>P. rubens</i>	36.9	0.77	1.03	1.29	1.50												1
26 <i>P. sitchensis</i>	35.4																1
27 <i>Pieris japonica</i>	4.1												1.92	1.40			12
28 <i>Pinus banksiana</i>	45.5		0.668														4
29 <i>P. contorta</i>	45.6		0.708										11.40	9.05	11.67		8,9,11
30 <i>P. elliotii</i>	39.2		0.63		0.90								6.45	5.51	6.69		8,9,11
31 <i>P. palustris</i>			0.73		1.10												7
32 <i>P. ponderosa</i> X <i>P. montezumae</i>	45.6	0.62	0.82	1.01	1.20												7
33 <i>P. resinosa</i>	47.7	0.60	0.78	0.97	n.r. ^h			1.7	7.5	13.2	19.3		4.80	3.83	8.72		1,3,8,9
34 <i>P. rigida</i>	48.3									23	17.5						2,6
35 <i>P. strobus</i>	66.7	0.27	0.47	0.68	0.75	0.42	0.15	3.9	7.5	11.2	12.1						1,2,3
36 <i>P. sylvestris</i>	53.6																8,9,10
37 <i>Podocarpus macrophylla</i>	13.1		0.58		1.84								2.92	1, 2.69	2.93		7
38 <i>Prunus laurocerasus</i> cv. <i>Schipkaensis</i>	4.2	1.32	3.00	4.68	6.00			3.4	27.7	52.0	95						1,3
39 <i>P. persica</i>	3.6																4
												201-400					

Table 2 (cont.)

Species	ICV ^a (μm^3)	Whole-plant irradiations ^b										Seed irradiations (kR)			Reference (see key) ^e		
		Acute (kR)						Chronic (R/day)				Severe effect ^c	50% germi- nation	50% sur- vival		50% dry weight ^d	
		LD ₁₀	LD ₅₀	LD ₉₀	LD ₁₀₀	Severe effect ^c	Slight effect ^c	LD ₁₀	LD ₅₀	LD ₉₀	LD ₁₀₀						
40 <i>Psidium guajava</i>																	
41 <i>Pseudotsuga menziesii</i> (<i>P. douglasii</i>)	28.5	0.08	0.46	1.17	n.r. ^h						21.0			17			5 1,2
42 <i>P. menziesii</i> (Interior)	17.1													7.50	5.95		12
43 <i>P. menziesii</i> (Coastal)	20.1													5.53	2.50		12
44 <i>Pyrus malus</i>	3.5												101-200				
45 <i>Quercus alba</i>	6.6																4
46 <i>Q. borealis</i> (<i>Q. rubra</i> var. <i>maxima</i>)	6.1	2.23	3.65	5.07	5.00 ^f	5.00	2.00	61.2	119	110 177	225			6.0			6,13 1,2,3
47 <i>Quercus coccinea</i>	3.6																
48 <i>Q. ilicifolia</i>	4.5									110 90							6
49 <i>Sambucus canadensis</i>	19.2	0.74	1.12	1.49	2.00	1.35	0.90				75						6
50 <i>Sequoiadendron giganteum</i>	19.6	0.90	1.14	1.38	1.50												1,2 1
51 <i>Taxus canadensis</i>	28.2	1.10	1.14	1.18	1.60												
52 <i>T. media</i> cv. <i>Hatfieldii</i>	23.7	0.32	0.84	1.39	n.r. ^h	0.20		7.3	8.8	10.3	15.0	30-50					1 1,2,3,4
53 <i>Thuja occidentalis</i>	24.7	0.45	0.97	1.49	1.50	1.25	0.60	9.2	29.4	49.7	53		3.35	2.49	4.17		1,2,3,8,9
54 <i>Tsuga canadensis</i>	40.2	0.38	0.70	1.01	1.03												1
55 <i>T. heterophylla</i>	22.3												2.53	1.29			12
56 <i>Vaccinium angustifolium</i>	2.6									10							6
57 <i>V. vacillans</i>										100							
58 <i>Viburnum dilatatum</i>	15.4	2.10	3.62	5.15	n.r. ^h					68.8	n.r. ^h						6
59 <i>Vitis labrusca</i>	2.0								32.5								1,3
60 <i>V. rotundifolia</i>															<4		5
61 <i>V. vinifera</i> X <i>V. rotundifolia</i>															<4		5
															<5		5
62 <i>Zamia floridana</i>	28.9		0.61		1.28												7

^aIf ICV differs from that given in Table 6, the value given here was determined from control plants, or was taken from the same source as sensitivity data.

^bWhen different values have been published by the same author(s) the most recent figures have been used here.

^cGenerally expressed as growth inhibition.

^dSeedling shoot.

^eReferences:

1. Sparrow, Rogers & Schwemmer (1968)	6. Woodwell & Sparrow (1963)	10. Bowen (1962)
2. Sparrow, Sparrow, Thompson & Schairer (1965)	7. Capella & Conger (1967)	11. Rudolph (1971)
3. Sparrow, Schwemmer, Klug & Pugliese (1970a)	8. Rudolph & Mikache (1970)	12. El Lakany & Sziklai (1970a,b)
4. Sparrow & Gunkel (1956)	9. Mikache & Rudolph (1968)	13. Stairs (1963)
5. Osborne & Lunden (1961)		

^fWhen LD₁₀₀ is exceeded by LD₉₀, LD₁₀₀ is generally an observed value and LD₉₀ is computer-estimated from survival curves.

^gVery young seedlings.

^hLethal dose not reached.

Table 3

Chromosome number, nuclear volume, ICV and sensitivity (D_0)
of one-celled gametophytes of 29 species of ferns.

Species	Chromosome Number ($1n$)	Nuclear volume ^a (μm^3)	ICV (μm^3)	D_0 (krad) ^b
1 <i>Adiantum pedatum</i> L.	c.29 ^c	319	11.0	3.29
2 <i>A. tenerum</i> Sw.	30	278	9.3	2.14
3 <i>Angiopteris hypoleuca</i> de Vriese	c.80	175	2.2	
4 <i>Asplenium nidus</i> L.	36	293	8.1	
5 <i>A. ruta-muraria</i> L.	c.72	300	4.2	
6 <i>Blechnum indicum</i> Burm.	36	502	13.9	2.16
7 <i>B. patersonii</i> (R.Br.) Mett.	60	385	6.4	
8 <i>B. spicant</i> (L.) J. Sm.	34	366	10.8	1.84
9 <i>Cheilanthes hirta-ellisiana</i>	c.116	820	7.1	3.81
10 <i>Cryptogramma crispa</i> (L.) R. Br.	30	372	12.4	2.58
11 <i>Cyclosorus unitas</i> (L.) Ching	36 ^c	188	5.2	
12 <i>Cystopteris fragilis</i> (L.) Bernh.	84 ^c	598	7.1	
13 <i>Dryopteris filix-mas</i> (L.) Schott	82 ^c	652	8.0	2.80
14 <i>Lygodium japonicum</i> (Thunb.) Sw.	58	558	9.6	1.61
15 <i>Onoclea sensibilis</i> L.	37	717	19.4	1.16
16 <i>Osmunda cinnamomea</i> L.	22 ^c	1887	85.8	
17 <i>O. regalis</i> L.	22	462	21.0	0.63
18 <i>Phymatodes nigrescens</i> (Bl.) J. Sm.	36 ^c	365	10.1	
19 <i>Pityrogramma triangularis</i> (Kaulf.) Maxon	c.60	410	6.8	
20 <i>Polypodium australe</i> Fee	c.90	1119	12.4	1.24
		1403	15.6	1.59
21 <i>P. interjectum</i> Shivas & Manton	111	589	5.3	
22 <i>P. vulgare</i> L.	c.74	674	9.1	2.23
23 <i>Polystichum aculeatum</i> (L.) Roth	82	380	4.6	3.14
24 <i>Pteridium aquilinum</i> (L.) Kuhn	52 ^c	435	8.6	
25 <i>Pteris longifolia</i> L.	58	922	15.9	
26 <i>P. quadriaurita</i> Retz.	c.87	345	4.0	
27 <i>Rumohra adiantiformis</i> (G. Forst.) Ching	41 ^c	368	9.0	
28 <i>Woodwardia orientalis</i> Sw.	34	510	15.0	
29 <i>W. radicans</i> (L.) Sm.	34	459	13.5	2.05

^aNuclear volumes for species without sensitivity data from A. H. Sparrow & A. F. Nauman, unpublished; for species with sensitivity data, from Sparrow, Howard, Cowie, Schwemmer & Nauman (1975).

^bData from Sparrow, Howard, Cowie, Schwemmer & Nauman (1975).

^cFrom the literature. All other counts made or confirmed in A. H. Sparrow laboratory.

Table 4
Chromosome number, nuclear volume, ICV and sensitivity (LD₅₀)
of sporophytes or gametophytes of 11 species of lower plants.

Species	Tissue measured	Stage of life cycle ^a	Chromosome number	Nuclear volume (μm^3)	ICV (μm^3)	LD ₅₀ (kR)	Ref. ^b
Bryophyta							
Musci (mosses)							
1 <u>Mnium</u> sp.	Shoot apex except apical cell and its first derivatives	Gam.	$1n = c.7$	60	8.6		1
2 <u>Sphagnum</u> sp.	Central meristem of shoot apex	Gam.	$1n = 19$	20	1.1		1
Hepaticae (liverworts)							
3 <u>Marchantia polymorpha</u> L.	Gemmae, apical cell	Gam.	$1n = 9$	99	11.0	12.2	2
	Gemmae, non-apical	Gam.	$1n = 9$	55	6.1	36.2	2
	Thalli, apical cell	Gam.	$1n = 9$	117	12.9	6.6	3
	Thalli, cells adjacent to rhizoids	Gam.	$1n = 9$	12	1.4	33.0	3
4 <u>Riccia</u> sp.	Thalli, cells in and near apical notch	Gam.	$1n = 3^c$	64	8.0		1
Tracheophyta							
Psilopsida							
5 <u>Psilotum nudum</u> (L.) Beauv.	Shoot apex except apical cell	Spor.	$2n = 208^c$	3844	18.5		1
6 <u>Tmesipteris</u> sp.	Shoot apex except apical cell	Spor.	$2n = 416$	9366	22.5		1
Lycopsidea (clubmosses, quillworts)							
7 <u>Isoetes engelmanni</u> A. Br.	Shoot apex	Spor.	$2n = 22$	498	22.6		1
8 <u>Lycopodium lucidulum</u> Michx.	Shoot apex	Spor.	$2n = 264$	296	1.1		1
9 <u>Selaginella kraussiana</u> Braun var. <u>brownii</u> Hort.	Shoot apex	Spor.	$2n = 20$	77	3.9		1
Sphenopsida (horsetails)							
10 <u>Equisetum arvense</u> L.	Shoot apex except apical cell	Spor.	$2n = 216$	1124	5.2		1
11 <u>E. hyemale</u> L.	Shoot apex except apical cell	Spor.	$2n = 216$	1060	4.9		1

^aGametophyte or sporophyte.

^bReferences for volume and sensitivity data: 1. Sparrow, Price & Underbrink (1972); 2. Miller, Sparrow & Rogers (1965); 3. Miller & Sparrow (1965).

^cChromosome counts made in A. H. Sparrow laboratory. All others from the literature.

Table 5

Family, class, life span, ploidy, chromosome number, nuclear volume, interphase chromosome volume (ICV), genome volume, estimated 3C DNA content, and estimated LD₅₀ of 780 species of herbaceous^a angiosperms

Species ^b	Family	Class ^c	Life span ^d	Ploidy and chromosome number(2n) ^e	Nuclear volume ^f (μm ³)	ICV ^g (μm ³)	Genome volume ^h (μm ³)	Est. 3C DNA ⁱ (pg)	Est. LD ₅₀ ^j (kR)
1. <i>Achillea collina</i> Beck	Compositae	Dic.	Per.	4x = 36	349	9.7	87	23	7.8
2. <i>Actaea alba</i> (L.) Mill.	Ranunculaceae	Dic.	Per.	2x = 16	288	18.0	144	19	4.2
3. <i>A. rubra</i> (Alt.) Willd.	Ranunculaceae	Dic.	Per.	2x = 16	352	22.0	176	24	3.4
4. <i>Aegilops speltoides</i> Tausch.	Gramineae	Mon.	Ann.	2x = 14	234	16.7	117	16	4.5
5. <i>A. squarrosa</i> L. var. <i>typica</i>	Gramineae	Mon.	Ann.	2x = 14	222	15.8	111	15	4.8
6. <i>Agapanthus mooreanus</i> Hort.	Liliaceae	Mon.	Per.	2x = 30	885	29.5	443	59	2.6
7. <i>Agave amanjensis</i> Trel. & Nowell	Amaryllidaceae	Mon.	Per.	2x = 60	387	6.5	194	26	11.6
8. <i>A. rigida</i> Mill.	Amaryllidaceae	Mon.	Per.	c. 5x = 149	712	4.8	c. 142	48	15.7
9. <i>Agropyron</i> sp. hybrid	Gramineae	Mon.	Per.	3x = 21	225	10.7	75	15	7.1
10. <i>A. cristatum</i> (L.) Gaertn.	Gramineae	Mon.	Per.	2x = 14 ^k	290	20.7	145	19	3.7
11. <i>A. intermedium</i> (Host) Beauv.	Gramineae	Mon.	Per.	6x = 42	432	10.3	72	29	7.3
12. <i>A. trachycaulum</i> (Link) Malte var. <i>glaucum</i> (Pease & Moore) Malte	Gramineae	Mon.	Per.	4x = 28	338	12.1	85	23	6.2
13. <i>Aletris farinosa</i> L.	Amaryllidaceae	Mon.	Per.	2x = 26 ^k	210	8.1	105	14	9.3
14. <i>Allium ampeloprasum</i> L. (Uncertain)	Liliaceae	Mon.	Per.	6x = 48 ^k	2097	43.7	349	140	1.7
15. <i>A. cepa</i> L. cv. Excel	Liliaceae	Mon.	Per.	2x = 16 ^k	628	39.3	314	42	1.9
16. <i>A. cepa</i> L. cv. Yamaguchi-Kohdaka	Liliaceae	Mon.	Per.	2x = 16	612	38.2	306	41	2.0
17. <i>A. cepa</i> L. cv. Yellow Sweet Spanish	Liliaceae	Mon.	Per.	2x = 16	649	40.6	325	49	1.7
18. <i>A. cepa</i> L. X <i>A. fistulosum</i> L. cv. Beltsville Bunching	Liliaceae	Mon.	Per.	4x = 32	662	20.7	166	44	3.7
19. <i>A. cernuum</i> Roth	Liliaceae	Mon.	Per.	2x = 14 ^k	639	45.7	320	43	1.7
20. <i>A. fistulosum</i> L. cv. Kujyo	Liliaceae	Mon.	Per.	2x = 16	472	29.5	236	32	2.6
21. <i>A. porrum</i> L. cv. Broad London	Liliaceae	Mon.	Per.	4x = 32	1111	34.72	278	74	2.2
22. <i>A. sativum</i> L.	Liliaceae	Mon.	Per.	2x = 16	532	33.28	266	36	2.3
23. <i>A. scorodoprasum</i> L.	Liliaceae	Mon.	Per.	6x = 48 ^k	2207	45.98	368	148	1.6
24. <i>A. senescens</i> L.	Liliaceae	Mon.	Per.	4x = 32	870	27.19	217	58	2.8
25. <i>A. tanguticum</i> Regel	Liliaceae	Mon.	Per.	6x = 48	825	17.18	137	55	4.4
26. <i>A. tricoccum</i> Alt.	Liliaceae	Mon.	Per.	2x = 16 ^k	850	53.11	212	57	1.4
27. <i>A. tuberosum</i> Rottler	Liliaceae	Mon.	Per.	4x = 32	803	25.08	201	54	3.0
28. <i>A. vineale</i> L.	Liliaceae	Mon.	Per.	4x = 32 ^k	682	21.32	171	46	3.5
29. <i>Aloe brevifolia</i> Mill.	Liliaceae	Mon.	Per.	2x = 14	917	65.49	458	61	1.1
30. <i>Alternanthera philoxeroides</i> Griseb.	Amaranthaceae	Dic.	Per.	?x = 94 ^k	259	2.75	--	17	27.0
31. <i>Althaea rosea</i> L.	Malvaceae	Dic.	Bi.	6x = 42	164	3.90	27	11	19.4
32. <i>Amaranthus hybridus</i> L.	Amaranthaceae	Dic.	Ann.	4x = 32	121	3.80	30	8	19.9
33. <i>Amaryllis belladonna</i> L.	Amaryllidaceae	Mon.	Per.	2x = 22	1243	56.51	622	83	1.3
34. <i>Amsinckia tessellata</i> Gray	Boraginaceae	Dic.	Ann.	2x = 24	182	7.57	91	12	9.9
35. <i>Anacyclus officinarum</i> Hayne	Compositae	Dic.	Ann.	2x = 18	197	10.96	99	13	6.9
36. <i>Andropogon barbinodis</i> Lag.	Gramineae	Mon.	Per.	18x = 180	164	0.91	9	11	84.0
37. <i>A. gerardi</i> Vitm.	Gramineae	Mon.	Per.	6x = 60	147	2.46	25	10	30.2
38. <i>A. scoparius</i> Michx.	Gramineae	Mon.	Per.	4x = 40	254	6.36	64	17	11.8
39. <i>Anellema acuinociale</i> Kunth	Commelinaceae	Mon.	Per.	6x = 54 ^k	398	7.38	66	27	10.2
40. <i>A. beninense</i> Kunth ssp. <i>beninense</i>	Commelinaceae	Mon.	Per.	4x = 52 ^k	250	4.80	62	17	15.7
41. <i>A. beninense</i> Kunth spp. <i>leonensis</i>	Commelinaceae	Mon.	Per.	6x = 78 ^k	470	6.03	78	31	12.6

Table 5 (cont.)

Species ^b	Family	Class ^c	Life span ^d	Ploidy and chromosome number (2n) ^e	Nuclear volume ^f (μm^3)	ICy8 (μm^3)	Genome volume ^h (μm^3)	Est. 3C DNA ⁱ (pg)	Est. LD ₅₀ ^j (kR)
42. <i>Anemone fulgens</i> J. Gay	Ranunculaceae	Dic.	Per.	2x = 16 ^k	467	29.21	234	31	2.6
43. <i>A. pulsatilla</i> L.	Ranunculaceae	Dic.	Per.	4x = 32 ^k	418	13.07	105	28	5.8
44. <i>Anethum graveolens</i> L.	Umbelliferae	Dic.	Ann.	2x = 22	151	6.87	76	10	11.0
45. <i>Antirrhinum majus</i> L.	Scrophulariaceae	Dic.	Per.	2x = 16	83	5.22	42	6	14.5
46. <i>Aphanes arvensis</i> (L.) Scop.	Rosaceae	Dic.	Ann.	6x = 48	59	1.23	10	4	63.0
47. <i>Aphanostephus skirrhobasis</i> (DC.) Trel.	Compositae	Dic.	A,B	2x = 6	67	11.19	34	5	6.8
48. <i>Apium graveolens</i> L. var. dulce Pers. cv. Cornell 619	Umbelliferae	Dic.	Bi.	2x = 22	159	7.22	80	11	10.5
49. <i>A. graveolens</i> L. var. dulce Pers. cv. Tall Utah	Umbelliferae	Dic.	Bi.	2x = 22	136	6.17	68	9	12.2
50. <i>Aplectrum hyemale</i> (Muhl.) Torr.	Orchidaceae	Mon.	Per.	2x = c.30 ^k	219	c.7.32	110	15	10.4
51. <i>Aploleia monandra</i> (Swartz) W. E. Moore	Commelinaceae	Mon.	Per.	2x = 14 ^k	254	18.15	127	17	4.2
52. <i>Apocynum cannabinum</i> L.	Apocynaceae	Dic.	Per.	2x = 22	49	2.24	25	3	34.3
53. <i>Aquilegia caerulea</i> James	Ranunculaceae	Dic.	Per.	2x = 14	70	5.03	35	5	15.1
54. <i>A. canadensis</i> L.	Ranunculaceae	Dic.	Per.	2x = 14	58	4.14	29	4	18.4
55. <i>A. longissima</i> Gray	Ranunculaceae	Dic.	Per.	2x = 14	268	19.15	134	18	3.9
56. <i>Arabis thaliana</i> (L.) Heynh.	Cruciferae	Dic.	Ann.	2x = 10	30	2.98	15	2	25.2
57. <i>Arachis hypogaea</i> L.	Leguminosae	Dic.	Ann.	4x = 40	300	7.50	75	20	10.1
58. <i>Arenaria montana</i> L.	Caryophyllaceae	Dic.	Per.	2x = 20	165	8.27	83	11	9.1
59. <i>Artemisia vulgaris</i> L.	Compositae	Dic.	Per.	2x = 18	427	23.75	214	29	3.2
60. <i>Asclepias syriaca</i> L.	Asclepiadaceae	Dic.	Per.	2x = 22	57	2.60	29	4	29.1
61. <i>Asparagus officinalis</i> L.	Liliaceae	Mon.	Per.	1x = 10	68	6.78	68	5	11.1
62. <i>A. officinalis</i> L. cv. Mary Washington	Liliaceae	Mpn.	Per.	2x = 20	136	6.79	68	9	11.1
63. <i>A. officinalis</i> L.	Liliaceae	Mon.	Per.	3x = 30	164	5.47	55	11	13.7
64. <i>A. officinalis</i> L.	Liliaceae	Mon.	Per.	4x = 40	217	5.42	54	15	14.0
65. <i>Aster tataricus</i> L. f.	Compositae	Dic.	Per.	6x = 54	471	8.71	78	32	8.7
66. <i>A. tripolium</i> L.	Compositae	Dic.	Per.	2x = 18	531	29.49	265	36	2.6
67. <i>Avena sativa</i> L. cv. Cherokee	Gramineae	Mon.	Ann.	6x = 42	645	15.35	107	43	4.9
68. <i>A. sativa</i> L. cv. Orbit	Gramineae	Mon.	Ann.	6x = 42	829	19.73	138	55	3.8
69. <i>A. sterilis</i> L.	Gramineae	Mon.	Ann.	6x = 42	779	18.56	130	52	4.1
70. <i>A. sterilis</i> L.	Gramineae	Mon.	Ann.	12x = 84	959	11.41	80	64	6.6
71. <i>A. strigosa</i> Schreb.	Gramineae	Mon.	Ann.	2x = 14	232	16.57	116	16	4.6
72. <i>A. strigosa</i> Schreb.	Gramineae	Mon.	Ann.	4x = 28	409	14.60	102	27	5.2
73. <i>Baptisia</i> sp.	Leguminosae	Dic.	Per.	2x = 18 ^k	126	7.01	63	8	10.8
74. <i>Barbarea verna</i> (Mill.) Aschers.	Cruciferae	Dic.	B,P	2x = 16	50	3.10	25	3	24.4
75. <i>Begonia phyllomanica</i> Mart. cv. Templinil	Begoniaceae	Dic.	Per.	2x = 26 ^k	77	2.96	38	5	25.2
76. <i>Belosynapsis kewensis</i> Hassk.	Commelinaceae	Mon.	Per.	4x = 52 ^k	211	4.05	106	14	18.4
77. <i>B. kewensis</i> Hassk.	Commelinaceae	Mon.	Per.	c.4x = 50 ^k	182	3.64	c.46	12	21.0
78. <i>Beta cicla</i> Hegetschw.	Chenopodiaceae	Dic.	Bi.	2x = 18	82	4.53	41	6	16.8
79. <i>B. vulgaris</i> L. (sugar beet)	Chenopodiaceae	Dic.	Bi.	2x = 18	79	4.37	39	5	17.2
80. <i>B. vulgaris</i> L. cv. Detroit Dark Red	Chenopodiaceae	Dic.	Bi.	2x = 18	91	5.05	45	6	15.1
81. <i>Bletia hyacinthina</i> R. Br.	Orchidaceae	Mon.	Per.	2x = 32	245	7.66	123	16	9.8
82. <i>Bothriochloa saccharoides</i> (Sw.) Rydb. var. <i>longipaniculata</i> (Gould) Gould	Gramineae	Mon.	Per.	12x = 120	517	4.31	43	35	17.6

Table 5 (cont.)

	Species ^b	Family	Class ^c	Life span ^d	Ploidy and chromosome number (2n) ^e	Nuclear volume ^f (μm^3)	ICyS (μm^3)	Genome volume ^h (μm^3)	Est. 3C DNA ⁱ (pg)	Est. LD50 ^j (kR)
83.	<i>B. saccharoides</i> (Sw.) Rydb. var. <i>torreyana</i> (Steud.) Gould	Gramineae	Mon.	Per.	6x = 60	388	6.47	65	26	11.6
84.	<i>Bouteloua curtipendula</i> (Michx.) Torr. var. <i>curtipendula</i>	Gramineae	Mon.	Per.	4x = 40	92	2.31	23	6	32.9
85.	<i>B. gracilis</i> (Willd. ex HBK) Lag. ex Griffiths	Gramineae	Mon.	Per.	4x = 40 ^k	130	3.28	33	9	22.9
86.	<i>B. uniflora</i> Vasey	Gramineae	Mon.	Per.	2x = 20	74	3.71	37	5	20.4
87.	<i>Brassica campestris</i> L. cv. Echo	Cruciferae	Dic.	Ann.	2x = 20	90	4.48	45	6	16.8
88.	<i>B. hirta</i> Moench	Cruciferae	Dic.	Ann.	2x = 24	80	3.37	40	5	22.2
89.	<i>B. juncea</i> (L.) Cosson	Cruciferae	Dic.	Ann.	4x = 36	107	2.97	27	7	25.2
90.	<i>B. kaber</i> (DC.) L. Wheeler	Cruciferae	Dic.	Ann.	2x = 18	56	3.09	28	4	24.4
91.	<i>B. napobrassica</i> Mill.	Cruciferae	Dic.	Bi.	4x = 38	162	4.27	41	11	17.6
92.	<i>B. napus</i> L.	Cruciferae	Dic.	Ann.	4x = 38	52	1.38	13	4	54.0
93.	<i>B. nigra</i> (L.) Koch	Cruciferae	Dic.	Ann.	2x = 16	69	4.33	35	5	17.6
94.	<i>B. oleracea</i> L.	Cruciferae	Dic.	Per.	2x = 18	66	3.65	33	4	20.4
95.	<i>B. oleracea</i> L. var. <i>acephala</i> DC. cv. Louisiana Sweet	Cruciferae	Dic.	Bi.	2x = 18 ^k	104	5.78	52	7	13.0
96.	<i>B. oleracea</i> L. var. <i>botrytis</i> L. cv. Monarch	Cruciferae	Dic.	Bi.	2x = 18 ^k	150	8.36	75	10	9.0
97.	<i>B. oleracea</i> L. var. <i>botrytis</i> L. cv. Snowball	Cruciferae	Dic.	Bi.	2x = 18 ^k	124	6.88	62	8	11.0
98.	<i>B. oleracea</i> L. var. <i>capitata</i> L. cv. Nozaki-Natsunaki	Cruciferae	Dic.	Bi.	2x = 18	105	5.83	52	7	13.0
99.	<i>B. oleracea</i> L. var. <i>capitata</i> L. cv. Yoshin	Cruciferae	Dic.	Bi.	2x = 18	112	6.23	56	8	12.2
100.	<i>B. oleracea</i> L. var. <i>capitata</i> L. cv. Ferry's Round Dutch	Cruciferae	Dic.	Bi.	2x = 18	116	6.43	58	8	11.8
101.	<i>B. oleracea</i> L. var. <i>gemmifera</i> Zenker cv. Long Island Improved	Cruciferae	Dic.	Bi.	2x = 18	65	3.64	33	4	21.0
102.	<i>B. oleracea</i> L. var. <i>italica</i> Plenck cv. Waltham 29	Cruciferae	Dic.	Bi.	2x = 18 ^k	80	4.44	40	5	17.2
103.	<i>B. pekinensis</i> Skeels cv. Kenshin	Cruciferae	Dic.	Ann.	2x = 20	86	4.30	43	6	17.6
104.	<i>B. rapa</i> L.	Cruciferae	Dic.	Bi.	2x = 20	60	3.01	30	4	25.2
105.	<i>B. rapa</i> L. var. <i>glabra</i> cv. Shogoin	Cruciferae	Dic.	Bi.	2x = 20	62	3.09	31	4	24.4
106.	<i>B. rapa</i> L. var. <i>glabra</i> cv. Shogoin	Cruciferae	Dic.	Bi.	4x = 40	198	4.96	50	13	15.1
107.	<i>Briza maxima</i> L.	Gramineae	Mon.	Ann.	2x = 14	238	17.02	119	16	4.4
108.	<i>Brodiaea bridgesii</i> S. Wats.	Liliaceae	Mon.	Per.	4x = 28 ^k	637	22.74	159	43	3.3
109.	<i>B. congesta</i> Sm.	Liliaceae	Mon.	Per.	4x = 32 ^k	490	15.32	123	33	4.9
110.	<i>B. laxa</i> S. Wats.	Liliaceae	Mon.	Per.	4x = 28 ^k	561	20.03	140	38	3.8
111.	<i>Bromus inermis</i> Leyss. cv. Fisher	Gramineae	Mon.	Per.	8x = 56	552	9.87	69	37	7.6
112.	<i>Buforrestia imperforata</i> C. B. Clarke	Commelinaceae	Mon.	Per.	2x = c. 22 ^k	87	c. 3.97	44	6	18.9
113.	<i>Bulbostylis capillaris</i> (L.) C. B. Clarke	Cyperaceae	Mon.	Ann.	c. 17x = 84	93	1.09	c. 5	6	68.7
114.	<i>Cabomba caroliniana</i> Gray	Nymphaeaceae	Dic.	Per.	2x = 24	426	17.76	213	28	4.2

Table 5 (cont.)

Species ^b	Family	Class ^c	Life span ^d	Ploidy and chromosome number (2n) ^e	Nuclear volume ^f (μm^3)	ICVg (μm^3)	Genome volume ^h (μm^3)	Est. 3C DNA ⁱ (pg)	Est. LD50 ^j (kR)
115. <i>Callisia elegans</i> Alexander	Commelinaceae	Mon.	Per.	2x = 12 ^k	456	38.02	228	31	2.0
116. <i>C. fragrans</i> (Lindl.) Woodson	Commelinaceae	Mon.	Per.	2x = 12 ^k	580	48.31	290	39	1.6
117. <i>C. fragrans</i> (Lindl.) Woodson cv. Melnickoff	Commelinaceae	Mon.	Per.	2x = 12 ^k	611	50.94	306	41	1.5
118. <i>C. macdougallii</i> Miranda	Commelinaceae	Mon.	Per.	2x = 12 ^k	337	28.09	169	23	2.7
119. <i>C. repens</i> L.	Commelinaceae	Mon.	Per.	4x = 24 ^k	663	27.62	166	44	2.7
120. <i>C. soconuscensis</i> Matuda	Commelinaceae	Mon.	Per.	2x = 12 ^k	635	52.87	317	42	1.4
121. <i>C. tehuantepecana</i> Matuda	Commelinaceae	Mon.	Per.	2x = 12 ^k	480	39.99	240	32	1.9
122. <i>Calochortus macrocarpus</i> Dougl.	Liliaceae	Mon.	Per.	2x = 14	346	24.72	173	23	3.1
123. <i>C. splendens</i> Dougl. ex Benth.	Liliaceae	Mon.	Per.	2x = 14	428	30.59	214	29	2.5
124. <i>Calonyction aculeatum</i> (L.) House	Convolvulaceae	Dic.	Per.	2x = 30	166	5.55	83	11	13.5
125. <i>Camelina alyssum</i> Thell.	Cruciferae	Dic.	Ann.	6x = 42	77	1.83	13	5	39.8
126. <i>Campellia zanonii</i> (L.) HBK	Commelinaceae	Mon.	Per.	2x = 16 ^k	578	36.13	289	39	2.1
127. <i>Capsella bursa-pastoris</i> (L.) Medic.	Cruciferae	Dic.	Ann.	4x = 32	67	2.07	17	4	36.0
128. <i>Capsicum frutescens</i> L. cv. California Wonder	Solanaceae	Dic.	Ann.	2x = 24	155	6.45	77	10	11.6
129. <i>Carex pensylvanica</i> Lam.	Cyperaceae	Mon.	Per.	6x = 36	101	2.80	17	7	27.0
130. <i>Carrichtera vella</i> DC.	Cruciferae	Dic.	?	2x = 16	51	3.19	26	3	23.6
131. <i>Carthamus tinctorius</i> L. cv. Afghanistan	Compositae	Dic.	Ann.	2x = 24	212	8.84	106	14	8.6
132. <i>C. tinctorius</i> L. cv. Gila	Compositae	Dic.	Ann.	4x = 48	512	10.68	128	34	7.1
133. <i>C. tinctorius</i> L. cv. India	Compositae	Dic.	Ann.	2x = 24	194	8.09	97	13	9.3
134. <i>C. tinctorius</i> L. (N-10)	Compositae	Dic.	Ann.	2x = 24	199	8.28	99	13	9.1
135. <i>C. tinctorius</i> L. (US-10)	Compositae	Dic.	Ann.	2x = 24	280	11.66	140	19	6.5
136. <i>Cartonema parviflorum</i> Hassk.	Commelinaceae	Mon.	Per.	2x = 24 ^k	163	6.78	81	11	11.1
137. <i>C. phillyroides</i> F. Muell.	Commelinaceae	Mon.	Per.	2x = 24 ^k	129	5.39	65	9	14.0
138. <i>C. spicatum</i> R. Br.	Commelinaceae	Mon.	Per.	4x = 48 ^k	210	4.38	53	14	17.2
139. <i>Caulophyllum thalictroides</i> (L.) Michx.	Berberidaceae	Dic.	Per.	2x = 16	372	23.25	186	25	3.2
140. <i>Cerastium tomentosum</i> L.	Caryophyllaceae	Dic.	Per.	8x = 72 ^k	65	0.91	8	4	84.0
141. <i>Ceratophyllum demersum</i> L.	Ceratophyllaceae	Dic.	Per.	2x = 24	133	5.54	67	9	13.7
142. <i>C. submersum</i> L.	Ceratophyllaceae	Dic.	Per.	6x = 72 ^k	173	2.41	29	12	31.5
143. <i>Chaenactis xantiana</i> Gray	Compositae	Dic.	Ann.	2x = 14	155	11.09	78	10	6.8
144. <i>Chenopodium album</i> L.	Chenopodiaceae	Dic.	Ann.	4x = 36 ^k	159	4.41	40	11	17.2
145. <i>Chionodoxa luciliae</i> Boiss.	Liliaceae	Mon.	Per.	2x = 18	382	21.21	191	26	3.6
146. <i>Chlorophytum elatum</i> R. Br.	Liliaceae	Mon.	Per.	4x = 28	751	26.83	188	50	2.8
147. <i>Chrysanthemum</i> sp. cv. Diener's Hybrid	Compositae	Dic.	Per.	c. 15x = 138 ^k	1333	9.66	c. 89	89	7.8
148. <i>C. sp.</i> cv. May Queen (uncertain)	Compositae	Dic.	Per.	4x = 36 ^k	489	13.59	122	33	5.6
149. <i>C. arcticum</i> L.	Compositae	Dic.	Per.	c. 7x = 64 ^k	675	10.54	c. 96	45	7.2
150. <i>C. corymbosum</i>	Compositae	Dic.	Per.	2x = 18	270	15.00	135	18	5.0
151. <i>C. indicum</i> L.	Compositae	Dic.	Per.	6x = 54	358	6.62	60	24	11.5
152. <i>C. leucanthemum</i> Turcz.	Compositae	Dic.	Per.	4x = 36	462	12.84	116	31	5.9
153. <i>C. lacustre</i> Brot.	Compositae	Dic.	Per.	22x = 198	2709	13.68	123	181	5.5
154. <i>C. leucanthemum</i> L.	Compositae	Dic.	Per.	2x = 18 ^k	286	15.87	143	19	4.8
155. <i>C. nipponicum</i> Matsum.	Compositae	Dic.	Per.	2x = 18	318	17.68	159	21	4.3
156. <i>C. sonare</i>	Compositae	Dic.	Per.	c. 9x = 80	773	9.67	c. 86	52	7.8
157. <i>C. yezoense</i> Maekawa	Compositae	Dic.	Per.	c. 6x = 56 ^k	761	13.59	c. 127	51	5.6
158. <i>Chrysopsis falcata</i> (Pursh) Ell.	Compositae	Dic.	Per.	2x = 18 ^k	200	11.14	100	13	6.8
159. <i>C. mariana</i> (L.) Ell.	Compositae	Dic.	Per.	2x = 24 ^k	353	14.70	176	24	5.1
160. <i>Cicer arletianum</i> L.	Leguminosae	Dic.	Ann.	2x = 16	105	6.59	53	7	11.5

Table 5 (cont.)

Species ^b	Family	Class ^c	Life span ^d	Ploidy and chromosome number (2n) ^e	Nuclear volume ^f (μm^3)	ICVg (μm^3)	Genome volume ^h (μm^3)	Est. 3C DNA ⁱ (pg)	Est. LD ₅₀ ^j (kR)
161. <i>Cimicifuga americana</i> Michx.	Ranunculaceae	Dic.	Per.	2x = 16	392	24.48	196	26	3.1
162. <i>C. racemosa</i> (L.) Nutt.	Ranunculaceae	Dic.	Per.	2x = 16	424	26.53	212	28	2.9
163. <i>Citrullus vulgaris</i> Schrad. cv. Charleston Gray	Cucurbitaceae	Dic.	Ann.	2x = 22	94	4.27	47	6	17.6
164. <i>C. vulgaris</i> Schrad. cv. Kohgyoku-Midori	Cucurbitaceae	Dic.	Ann.	2x = 22	136	6.16	68	9	12.2
165. <i>Coleotrype natalensis</i> C. B. Clarke	Commelinaceae	Mon.	Per.	4x = 36 ^k	385	10.71	96	26	7.1
166. <i>Coleus blumei</i> Benth.	Labiatae	Dic.	Per.	8x = 48 ^k	214	4.46	27	14	16.8
167. <i>Collomia biflora</i> (Ruiz & Pav.) A. Brand	Polemoniaceae	Dic.	Ann.	4x = 32	380	11.88	95	25	6.3
168. <i>Commelina benghalensis</i> L.	Commelinaceae	Mon.	?	2x = 22 ^k	240	10.92	120	16	6.9
169. <i>C. benghalensis</i> L. cv. <i>variegata</i>	Commelinaceae	Mon.	?	6x = 66 ^k	502	7.61	84	34	9.9
170. <i>C. chamissonis</i> Klotzsch	Commelinaceae	Mon.	?	6x = 90 ^k	522	5.80	87	35	13.0
171. <i>C. communis</i> L.	Commelinaceae	Mon.	Ann.	6x = 90 ^k	595	6.61	99	40	11.5
172. <i>C. dianthifolia</i> Del.	Commelinaceae	Mon.	?	6x = 90 ^k	415	4.61	69	28	16.4
173. <i>C. diffusa</i> Burm. f.	Commelinaceae	Mon.	Per.	2x = 30 ^k	191	6.37	96	13	11.8
174. <i>C. diffusa</i> Burm. f.	Commelinaceae	Mon.	?	6x = 90 ^k	403	4.48	67	27	16.8
175. <i>C. ensifolia</i> R. Br.	Commelinaceae	Mon.	?	4x = 60 ^k	234	3.90	59	16	19.4
176. <i>C. ensifolia</i> R. Br.	Commelinaceae	Mon.	?	6x = 90 ^k	411	4.57	68	28	16.5
177. <i>C. erecta</i> L.	Commelinaceae	Mon.	Per.	4x = 60 ^k	290	4.83	72	19	15.7
178. <i>C. imberbis</i> Ehrenb. ex Hassk.	Commelinaceae	Mon.	?	2x = 30 ^k	181	6.04	91	12	12.6
179. <i>C. indehiscens</i> Barnes	Commelinaceae	Mon.	?	10x = 150 ^k	844	5.62	84	56	13.5
180. <i>C. undulata</i> R. Br.	Commelinaceae	Mon.	?	6x = 90 ^k	361	4.02	60	24	18.9
181. <i>Commelinantha anomala</i> (Torr.) Tharp	Commelinaceae	Mon.	Ann.	2x = 26 ^k	382	14.68	191	26	5.1
182. <i>Convallaria majalis</i> L.	Liliaceae	Mon.	Per.	2x = 38	1216	32.00	608	81	2.4
183. <i>Convolvulus tricolor</i> L.	Convolvulaceae	Dic.	Ann.	2x = 20	147	7.34	73	10	10.4
184. <i>Conyza canadensis</i> (L.) Cronq.	Compositae	Dic.	Ann.	2x = 18	92	5.10	46	6	14.8
185. <i>C. chilensis</i> Spreng.	Compositae	Dic.	Ann.	8x = 72	385	5.35	48	26	14.0
186. <i>Crepis capillaris</i> (L.) Wallr.	Compositae	Dic.	Ann.	2x = 6	195	32.56	98	13	2.3
187. <i>Crocus biflorus</i> Mill. var. <i>argenteus</i>	Iridaceae	Mon.	Per.	2x = 8	377	47.12	188	25	1.6
188. <i>C. chrysanthus</i> Herb. cv. E. P. Bowles	Iridaceae	Mon.	Per.	2x = 8	263	32.89	132	18	2.3
189. <i>C. olivieri</i> F. Gay	Iridaceae	Mon.	Per.	2x = 6	249	41.48	124	17	1.8
190. <i>Crotalaria retusa</i> L.	Leguminosae	Dic.	Ann.	2x = 16 ^k	173	10.80	86	12	7.0
191. <i>C. verrucosa</i> L.	Leguminosae	Dic.	Ann.	2x = 16 ^k	192	11.99	96	13	6.3
192. <i>Cucumis melo</i> L. var. <i>cantalupensis</i> Naud. cv. Golden Gate	Cucurbitaceae	Dic.	Ann.	2x = 24 ^k	117	4.88	59	8	15.4
193. <i>C. melo</i> L. var. <i>makuwa</i> cv. Ohgon-Nashi	Cucurbitaceae	Dic.	Ann.	2x = 24	151	6.31	76	10	12.0
194. <i>C. sativus</i> L. cv. Marketer	Cucurbitaceae	Dic.	Ann.	2x = 14	160	11.44	80	11	6.6
195. <i>C. sativus</i> L. cv. Chyojitsu-Ochiai	Cucurbitaceae	Dic.	Ann.	2x = 14	108	7.73	54	7	9.8
196. <i>Cucurbita maxima</i> Duchesne cv. Hubbard	Cucurbitaceae	Dic.	Ann.	4x = 40 ^k	64	1.60	16	4	47.2
197. <i>C. maxima</i> Duchesne cv. Tokyo-Kabochya	Cucurbitaceae	Dic.	Ann.	4x = 40	81	2.02	20	5	37.8
198. <i>C. moschata</i> Duchesne cv. Ructernut	Cucurbitaceae	Dic.	Ann.	4x = 40 ^k	90	2.25	23	6	32.9

Table 5 (cont.)

Species ^b	Family	Class ^c	Life span ^d	Ploidy and chromosome number (2n) ^e	Nuclear volume ^f (μm^3)	ICVB (μm^3)	Genome volume ^h (μm^3)	Est. 3C DNA ⁱ (pg)	Est. LD50 ^j (kR)
199. <i>C. pepo</i> L. cv. Royal Acorn	Cucurbitaceae	Dic.	Ann.	4x = 40	100	2.50	25	7	30.2
200. <i>C. pepo</i> L. var. <i>medullosa</i> Alef.	Cucurbitaceae	Dic.	Ann.	4x = 40 ^k	80	2.00	20	5	37.8
201. <i>Cyanotis arachnoidea</i> C. B. Clarke	Commelinaceae	Mon.	Per.	2x = 24 ^k	299	12.45	149	20	6.0
202. <i>C. cerifolia</i> Rolla Rao & Kammathy	Commelinaceae	Mon.	Per.	2x = 24 ^k	204	8.52	102	14	8.9
203. <i>C. nodiflora</i> Kunth	Commelinaceae	Mon.	Per.	2x = 26 ^k	320	12.32	160	21	6.1
204. <i>C. obtusa</i> Trimen	Commelinaceae	Mon.	Per.	2x = 24 ^k	144	5.99	72	10	12.6
205. <i>C. pilosa</i> Schult. f.	Commelinaceae	Mon.	Per.	2x = 24 ^k	186	7.74	93	12	9.8
206. <i>C. somaliensis</i> C. B. Clarke	Commelinaceae	Mon.	Per.	2x = 26 ^k	201	7.71	100	13	9.8
207. <i>C. villosa</i> Schult. f.	Commelinaceae	Mon.	Per.	2x = 24 ^k	270	11.27	135	18	6.7
208. <i>Cynara scolymus</i> L.	Compositae	Dic.	Per.	2x = 34	128	3.76	64	9	19.9
209. <i>Cypripedium acaule</i> Ait.	Orchidaceae	Mon.	Per.	2x = 20	1354	67.70	677	91	1.1
210. <i>C. calceolus</i> L. var. <i>pubescens</i> (Willd.) Correll	Orchidaceae	Mon.	Per.	2x = 20 ^k	767	38.34	383	51	2.0
211. <i>C. reginae</i> Walt.	Orchidaceae	Mon.	Per.	2x = 22	1069	48.61	535	72	1.6
212. <i>Dactylis glomerata</i> L. cv. Sterling	Gramineae	Mon.	Per.	4x = 28 ^k	264	9.44	66	18	8.0
213. <i>Dahlia</i> sp. cv. Rainbow	Compositae	Dic.	Per.	8x = 64 ^k	317	4.95	40	21	15.1
214. <i>Daucus carota</i> L.	Umbelliferae	Dic.	Bi.	2x = 18	82	4.57	41	6	16.4
215. <i>D. carota</i> L. var. <i>sativa</i> DC. cv. Long Emperor	Umbelliferae	Dic.	Bi.	2x = 18	73	4.03	36	5	18.9
216. <i>D. carota</i> L. var. <i>sativa</i> DC. cv. Senkoh-Sanzun	Umbelliferae	Dic.	Bi.	2x = 18	105	5.81	52	7	13.0
217. <i>Delphinium nudicaule</i> Torr. & Gray	Ranunculaceae	Dic.	Per.	2x = 16	198	12.39	99	13	6.1
218. <i>Dianthus caryophyllus</i> L. cv. Peter Fisher	Caryophyllaceae	Dic.	Per.	2x = 30	90	3.01	45	6	25.2
219. <i>D. caryophyllus</i> L. cv. Peter Fisher	Caryophyllaceae	Dic.	Per.	4x = 60	104	1.74	26	7	44.4
220. <i>D. caryophyllus</i> L. cv. William Sim	Caryophyllaceae	Dic.	Per.	4x = 60	114	1.90	29	8	39.8
221. <i>D. deltoides</i> L.	Caryophyllaceae	Dic.	Per.	2x = 30	91	3.04	46	6	25.2
222. <i>Dicentra spectabilis</i> Lem.	Fumariaceae	Dic.	Per.	2x = 16	117	7.30	58	8	10.4
223. <i>Dichondra repens</i> Forst. var. <i>carolinensis</i> (Michx.) Choisy	Convolvulaceae	Dic.	Per.	2x = 30 ^k	78	2.61	39	5	29.1
224. <i>Dichorisandra hexandra</i> (Aubl.) Standl.	Commelinaceae	Mon.	Per.	2x = 38 ^k	622	16.37	311	42	4.6
225. <i>D. reginae</i> (L. Lind. & Rodig.) W. Ludw.	Commelinaceae	Mon.	Per.	2x = 38 ^k	750	19.73	375	50	3.8
226. <i>D. thyrsiflora</i> Mikan	Commelinaceae	Mon.	Per.	2x = 38 ^k	597	15.72	299	40	4.8
227. <i>Digitalis lutea</i> L.	Scrophulariaceae	Dic.	Per.	4x = 112	285	2.54	71	19	30.2
228. <i>Digitaria sanguinalis</i> (L.) Scop.	Gramineae	Mon.	Ann.	4x = 36	93	2.60	23	6	29.1
229. <i>Diphyllaea cymosa</i> Michx.	Berberidaceae	Dic.	Per.	2x = 12	460	38.32	230	31	2.0
230. <i>Disporum lanuginosum</i> (Michx.) Nichols.	Liliaceae	Mon.	Per.	2x = 18	324	18.00	162	22	4.2
231. <i>Draba hispanica</i> Boiss.	Cruciferae	Dic.	Per.	2x = 16	48	2.99	24	3	25.2
232. <i>Drosophyllum lusitanicum</i> Link	Droseraceae	Dic.	Per.	2x = 12	406	33.90	203	27	2.2
233. <i>Echinochloa crus-galli</i> (L.) Beauv.	Gramineae	Mon.	Ann.	6x = 54	187	3.46	31	13	21.6
234. <i>Eichhornia crassipes</i> (Mart.) Solms	Pontederiaceae	Mon.	Per.	4x = 32	190	5.95	48	13	13.5
235. <i>Epilobium hirsutum</i> L. var. <i>albiflorum</i>	Onagraceae	Dic.	Per.	2x = 36	54	1.49	27	4	50.4
236. <i>Epimedium alpinum</i> L.	Berberidaceae	Dic.	Per.	2x = 12	201	16.75	101	14	4.5

Table 5 (cont.)

Species ^b	Family	Class ^c	Life span ^d	Ploidy and chromosome number (2n) ^e	Nuclear volume ^f (μm^3)	ICV ^g (μm^3)	Genome volume ^h (μm^3)	Est. 3C DNA ⁱ (pg)	Est. LD50 ^j (kR)
237. <i>E. macranthum</i> Morr. & Dcne. forma <i>roseum</i> Voss.	Berberidaceae	Dic.	Per.	2x = 12	213	17.77	107	14	4.2
238. <i>Epiphyllum truncatum</i> Haw.	Cactaceae	Dic.	Per.	2x = 22	174	7.91	87	12	9.6
239. <i>Eremopyrum fruticeum</i> (Gaertn.) Nevski	Gramineae	Mon.	Ann.	2x = 14 ^k	249	17.80	125	17	4.2
240. <i>Eruca sativa</i> Mill.	Cruciferae	Dic.	Ann.	2x = 22	90	4.11	45	6	18.4
241. <i>Erythronium americanum</i> Ker	Liliaceae	Mon.	Per.	4x = 48	1278	26.63	320	86	2.8
242. <i>Eschscholtzia californica</i> Cham.	Papaveraceae	Dic.	Ann.	2x = 12	79	6.54	39	5	11.6
243. <i>Euchlaena perennis</i> Hitchc.	Gramineae	Mon.	Per.	4x = 40	282	7.05	70	19	10.6
244. <i>Fagopyrum esculentum</i> Moench	Polygonaceae	Dic.	Ann.	2x = 16	132	8.25	66	9	9.1
245. <i>F. sagittatum</i> Gilib.	Polygonaceae	Dic.	Ann.	2x = 16	93	5.81	46	6	13.0
246. <i>Festuca elatior</i> L. var. <i>arundinacea</i> (Schreb.) Wimmer	Gramineae	Mon.	Per.	6x = 42 ^k	524	12.48	87	35	6.0
247. <i>F. ovina</i> L.	Gramineae	Mon.	Ann.	10x = 70	717	10.24	72	48	7.4
248. <i>Floscopa scandens</i> Lour.	Commelinaceae	Mon.	Per.	6x = 54 ^k	539	9.98	90	36	7.6
249. <i>Forrestia mollissima</i> (Bl.) Koorders	Commelinaceae	Mon.	Per.	4x = 36 ^k	482	13.38	121	32	5.6
250. <i>Fragaria</i> sp. cv. Northwest	Rosaceae	Dic.	Per.	8x = 56	210	3.74	26	14	20.4
251. <i>Fritillaria assyriaca</i> Baker	Liliaceae	Mon.	Per.	3x = 36	4083	113.43	1361	272	0.7
252. <i>F. camtschaticensis</i> Ker-Gawl.	Liliaceae	Mon.	Per.	3x = 36 ^k	2821	78.36	940	189	9.7
253. <i>F. lanceolata</i> Pursh.	Liliaceae	Mon.	Per.	2x = 24	1739	72.48	870	116	1.0
254. <i>F. meleagris</i> L. cv. Aphrodite	Liliaceae	Mon.	Per.	2x = 24 ^k	2704	112.69	1352	180	0.7
255. <i>F. verticillata</i> Willd.	Liliaceae	Mon.	Per.	2x = 24 ^k	1350	56.26	675	90	1.4
256. <i>Galium sylvestre</i> Poll. cv. <i>Vindobonense</i>	Rubiaceae	Dic.	Per.	4x = 44	141	3.20	35	9	23.6
257. <i>Gasteria</i> sp. hybrid	Liliaceae	Mon.	Per.	2x = 14 ^k	816	58.32	408	55	1.3
258. <i>Gentiana andrewsii</i> Griseb.	Gentianaceae	Dic.	Per.	2x = 26	179	6.90	90	12	11.0
259. <i>Geogenanthus undatus</i> (C. Koch & Lindl.) Mildbr. & Str.	Commelinaceae	Mon.	Per.	2x = 38 ^k	614	15.15	307	41	4.7
260. <i>Gibasis geniculata</i> (Jacq.) Rohw. (x = 5)	Commelinaceae	Mon.	Per.	2x = 10 ^k	299	29.91	150	20	2.5
261. <i>G. geniculata</i> (Jacq.) Rohw. (x = 8)	Commelinaceae	Mon.	Per.	2x = 16 ^k	593	37.06	297	40	2.0
262. <i>G. geniculata</i> (Jacq.) Rohw. (x = 8)	Commelinaceae	Mon.	Per.	4x = 32 ^k	351	10.96	88	24	6.9
263. <i>G. karwinskyana</i> (Schult. f.) Rohw.	Commelinaceae	Mon.	Per.	2x = 10 ^k	405	40.53	203	27	1.9
264. <i>G. karwinskyana</i> (Schult. f.) Rohw.	Commelinaceae	Mon.	Per.	3x = 15 ^k	659	43.94	220	44	1.7
265. <i>G. karwinskyana</i> (Schult. f.) Rohw.	Commelinaceae	Mon.	Per.	4x = 20 ^k	750	37.49	188	50	2.0
266. <i>G. pulchella</i> (HBK) Raf.	Commelinaceae	Mon.	Per.	2x = 10 ^k	604	60.44	302	40	1.3
267. <i>Gladiolus</i> sp. cv. Friendship	Iridaceae	Mon.	Per.	4x = 60 ^k	274	4.56	68	18	16.4
268. <i>G. sp.</i> cv. Mansour	Iridaceae	Mon.	Per.	c. 4x = 61 ^k	322	5.28	c. 81	22	14.3
269. <i>G. sp.</i> cv. Picardy	Iridaceae	Mon.	Per.	4x = 60 ^k	252	4.19	63	17	18.0
270. <i>G. sp.</i> cv. Spotlight	Iridaceae	Mon.	Per.	4x = 60 ^k	267	4.46	67	18	16.8
271. <i>G. alatus</i> L.	Iridaceae	Mon.	Per.	2x = 30	90	3.01	45	6	25.2
272. <i>G. blandus</i> Soland.	Iridaceae	Mon.	Per.	2x = 30	87	2.90	44	6	26.1
273. <i>G. carmineus</i> C. H. Wright	Iridaceae	Mon.	Per.	2x = 30	113	3.78	57	8	19.9
274. <i>G. muriei</i> Hort.	Iridaceae	Mon.	Per.	2x = 30 ^k	159	5.30	79	11	14.3
275. <i>Gloriosa superba</i> L.	Liliaceae	Mon.	Per.	2x = 22	578	26.27	289	39	2.9

Table 5 (cont.)

Species ^b	Family	Class ^c	Life span ^d	Ploidy and chromosome number (2n) ^e	Nuclear volume ^f (μm ³)	ICV ^g (μm ³)	Genome volume ^h (μm ³)	Est. 3C DNA ⁱ (pg)	Est. LD ₅₀ ^j (kR)
276. <i>Glycine max</i> (L.) Merr. cv. Hawkeye	Leguminosae	Dic.	Ann.	4x = 40	165	4.12	41	11	18.4
277. <i>G. max</i> (L.) Merr. cv. Tachisuzumari	Leguminosae	Dic.	Ann.	4x = 40	155	3.88	39	10	19.4
278. <i>Chaphallium obtusifolium</i> L.	Compositae	Dic.	Ann.	4x = 28k	296	10.58	74	20	7.1
279. <i>Goodyera pubescens</i> (Willd.) R. Br.	Orchidaceae	Mon.	Per.	2x = 26k	257	9.87	128	17	7.6
280. <i>Gossypium hirsutum</i> L. cv. Acala	Malvaceae	Dic.	Ann.	4x = 52	296	5.69	74	20	13.3
281. <i>G. hirsutum</i> L. cv. Deltapine	Malvaceae	Dic.	Ann.	4x = 52	301	5.79	75	20	13.0
282. <i>Cratogeomys bartramii</i> Rose	Crassulaceae	Dic.	Per.	2x = 62k	94	1.52	47	6	5.0
283. <i>G. macdougalii</i> Alexander (U507)	Crassulaceae	Dic.	Per.	7x = 384	307	0.80	---	21	94.5
284. <i>G. macdougalii</i> Alexander (long form)	Crassulaceae	Dic.	Per.	7x = 488	548	1.12	---	37	68.7
285. <i>G. pachyphyllum</i> Rose	Crassulaceae	Dic.	Per.	7x = 384	405	1.06	---	27	68.7
286. <i>G. paraguayense</i> (N. E. Brown) Walth.	Crassulaceae	Dic.	Per.	8x = 136	138	1.01	17	9	75.6
287. <i>Gutierrezia bracteata</i> Abrams	Compositae	Dic.	Per.	4x = 16	413	25.82	103	28	2.9
288. <i>G. californica</i> Torr. & Gray	Compositae	Dic.	Per.	6x = 24	377	15.72	63	25	4.8
289. <i>G. sarothracae</i> (Pursh) Britt. & Rusby	Compositae	Dic.	Per.	2x = 8	157	19.59	78	11	3.9
290. <i>Cypripedium elegans</i> Bieb.	Caryophyllaceae	Dic.	Ann.	2x = 26k	111	4.27	55	7	17.6
291. <i>Habenaria ciliaris</i> (L.) R. Br.	Orchidaceae	Mon.	Per.	3x = 42k	338	8.05	113	23	9.3
292. <i>Habenaria robusta</i> Herb. ex Lodd.	Amaryllidaceae	Mon.	Per.	2x = 12	541	45.12	271	36	1.7
293. <i>Hadrodemas warszewiczianum</i> (Kunth & Bouche) H. E. Moore	Commelinaceae	Mon.	Per.	2x = 16k	506	31.63	253	34	2.4
294. <i>Haemanthus albiflos</i> Jacq.	Amaryllidaceae	Mon.	Per.	2x = 16	1331	83.16	665	89	0.9
295. <i>H. katherinae</i> Baker	Amaryllidaceae	Mon.	Per.	2x = 18k	1872	103.99	936	125	0.7
296. <i>Haplopappus gracilis</i> (Nutt.) Gray	Compositae	Dic.	Per.	2x = 4k	130	32.48	65	9	2.3
297. <i>Haworthia attenuata</i> Haw.	Liliaceae	Mon.	Per.	2x = 14k	452	32.29	226	30	2.3
298. <i>H. fasciata</i> Haw.	Liliaceae	Mon.	Per.	2x = 14	674	48.12	337	45	1.6
299. <i>Haynaldia villosa</i> (L.) Schur.	Gramineae	Mon.	?	2x = 14k	298	21.31	149	20	3.6
300. <i>Helianthemum canadense</i> (L.) Michx.	Cistaceae	Dic.	Per.	2x = 20	53	2.65	26	4	28.0
301. <i>Helianthus annuus</i> L. cv. Mammoth Russian	Compositae	Dic.	Ann.	2x = 34	353	10.37	176	24	7.3
302. <i>Heliphila longifolia</i> DC.	Cruciferae	Dic.	Ann.	2x = 20k	51	2.53	25	3	30.2
303. <i>Hepatica acutiloba</i> DC.	Ranunculaceae	Dic.	Per.	2x = 14	580	41.45	290	39	1.8
304. <i>H. americana</i> (DC.) Ker	Ranunculaceae	Dic.	Per.	2x = 14	573	40.90	286	38	1.9
305. <i>Hesperis matronalis</i> L.	Cruciferae	Dic.	B,P	2x = 24	171	7.13	86	12	10.6
306. <i>Hibiscus acetosella</i> Welw. ex Hiern.	Malvaceae	Dic.	A,P	4x = 72	218	3.03	55	15	25.2
307. <i>H. acetosella</i> Welw. ex Hiern. X <i>H. cannabinus</i> L.	Malvaceae	Dic.	?	3x = 54	209	3.87	70	14	19.4
308. <i>H. acetosella</i> Welw. ex Hiern. X <i>H. cannabinus</i> L.	Malvaceae	Dic.	?	6x = 108	390	3.61	65	26	21.0
309. <i>H. asper</i> Hook.	Malvaceae	Dic.	?	2x = 36	92	2.54	46	6	30.2
310. <i>H. bifurcatus</i> Cav.	Malvaceae	Dic.	?	4x = 72	233	3.24	58	16	23.6
311. <i>H. cannabinus</i> L.	Malvaceae	Dic.	Ann.	2x = 36	172	4.76	86	12	15.7
312. (<i>H. cannabinus</i> L. X <i>H. acetosella</i> Welw. ex Hiern. 6x) X <i>H. diversifolius</i> Jacq.	Malvaceae	Dic.	?	7x = 126	378	3.00	54	25	25.2

Species ^b	Family	Class ^c	Life span ^d	body and chromosome number (2n) ^e	nuclear volume ^f (μm ³)	ICV ^g (μm ³)	Genome volume ^h (μm ³)	Est. 3C DNA ⁱ (pg)	Est. LD ₅₀ ^j (kR)
313. <i>H. cannabinus</i> L. X <i>H. meensei</i> Exell	Malvaceae	Dic.	?	3x = 54	232	4.29	77	16	17.6
314. <i>H. diversifolius</i> Jacq.	Malvaceae	Dic.	Per.	8x = 144	473	3.28	59	32	22.9
315. <i>H. diversifolius</i> Jacq. X <i>H. cannabinus</i> L. F ₁	Malvaceae	Dic.	?	5x = 90	287	3.19	57	19	23.6
316. <i>H. diversifolius</i> Jacq. X <i>H. diversifolius</i> Jacq. F ₁	Malvaceae	Dic.	?	8x = 144	414	2.87	52	28	26.1
317. <i>H. diversifolius</i> Jacq. X <i>H. maculatus</i> Lam. F ₁	Malvaceae	Dic.	?	9x = 162	429	2.65	48	29	28.0
318. <i>H. diversifolius</i> Jacq. X <i>H. maculatus</i> Lam. F ₂	Malvaceae	Dic.	?	9x = 162	500	3.09	56	33	24.4
319. <i>H. esculentus</i> L. cv. Emerald	Malvaceae	Dic.	Ann.	7x = 126 ^k	209	1.66	30	14	44.4
320. <i>H. furcellatus</i> Lam. X <i>H. bifurcatus</i> Cav. F ₁	Malvaceae	Dic.	?	4x = 72	196	2.73	49	13	28.0
321. <i>H. furcellatus</i> Lam. X <i>H. uncinellus</i> (Moc. & Sesse) ex DC. F ₁	Malvaceae	Dic.	?	4x = 72	201	2.79	50	13	27.0
322. <i>H. maculatus</i> Lam.	Malvaceae	Dic.	?	10x = 180	692	3.85	69	46	19.4
323. <i>H. meensei</i> Exell	Malvaceae	Dic.	?	4x = 72	186	2.59	47	13	29.1
324. <i>H. palustris</i> L.	Malvaceae	Dic.	Per.	2x = 38	115	3.02	57	8	25.2
325. <i>H. moscheutos</i> L.	Malvaceae	Dic.	Per.	2x = 38	139	3.65	69	9	20.4
326. <i>H. radiatus</i> Cav.	Malvaceae	Dic.	?	4x = 72	186	2.58	46	12	29.1
327. <i>H. radiatus</i> Cav. X <i>H. diversifolius</i> Jacq. F ₁	Malvaceae	Dic.	?	6x = 108	302	2.80	50	20	27.0
328. <i>H. radiatus</i> Cav. X <i>H. diversifolius</i> Jacq. F ₁	Malvaceae	Dic.	?	12x = 216	326	1.51	27	22	50.4
329. <i>H. rostellatus</i> Guill. & Per.	Malvaceae	Dic.	?	4x = 72	292	4.06	73	20	18.4
330. <i>H. sabdariffa</i> L.	Malvaceae	Dic.	A,P	4x = 72	169	2.34	42	11	32.9
331. <i>H. sabdariffa</i> L. X <i>H. meensei</i> Exell	Malvaceae	Dic.	?	8x = 144	204	1.41	25	14	54.0
332. <i>H. surattensis</i> L.	Malvaceae	Dic.	?	2x = 36	95	2.63	47	6	29.1
333. <i>H. uncinellus</i> (Moc. & Sesse) ex DC.	Malvaceae	Dic.	?	4x = 72	260	3.61	65	17	21.0
334. <i>Holcus gayanus</i> Boiss.	Gramineae	Mon.	Per.	2x = 8	135	16.85	67	9	4.5
335. <i>Hordeum distichon</i> L. cv. Hannchen	Gramineae	Mon.	Ann.	2x = 14	196	13.99	98	13	5.4
336. <i>H. distichon</i> L. cv. Opal B	Gramineae	Mon.	Ann.	2x = 14	263	20.91	146	20	3.6
337. <i>H. vulgare</i> L. cv. Chikurin	Gramineae	Mon.	Ann.	2x = 14	623	18.76	131	18	4.0
338. <i>H. vulgare</i> L. cv. Himalaya	Gramineae	Mon.	Ann.	2x = 14	344	24.56	172	23	3.1
339. <i>H. vulgare</i> L. cv. Mari	Gramineae	Mon.	Ann.	2x = 14	252	17.97	126	17	4.2
340. <i>Humulus lupulus</i> L.	Moraceae	Dic.	Per.	2x = 14	146	10.39	73	10	7.3
341. <i>Hyacinthus ciliatus</i> Cyrill.	Liliaceae	Mon.	Per.	2x = 18	243	13.51	122	16	5.6
342. <i>H. orientalis</i> L. cv. Delft Blue	Liliaceae	Mon.	Per.	c.4x = 30	1558	51.92	c.389	104	1.5
343. <i>H. orientalis</i> L. cv. Innocence	Liliaceae	Mon.	Per.	c.3x = 27	1758	65.12	c.586	118	1.2
344. <i>H. orientalis</i> L. cv. Pink Pearl	Liliaceae	Mon.	Per.	2x = 16 ^k	824	51.50	412	55	1.5
345. <i>Hypericum gentianoides</i> (L.) BSP	Guttiferae	Dic.	Ann.	2x = 24	63	2.64	32	4	29.1
346. <i>H. perforatum</i> L.	Guttiferae	Dic.	Per.	4x = 32	92	2.88	23	6	26.1
347. <i>H. virginicum</i> L.	Guttiferae	Dic.	Per.	2x = 38	69	1.80	34	5	42.0
348. <i>Impatiens balsamina</i> L.	Balsaminaceae	Dic.	Ann.	2x = 14	65	4.65	33	4	16.1
349. <i>I. sultanii</i> Hook. f.	Balsaminaceae	Dic.	Per.	2x = 16	118	7.36	59	8	10.2
350. <i>Ipomoea batatas</i> Poir.	Convolvulaceae	Dic.	Per.	6x = 90	284	3.15	47	19	23.6
351. <i>I. pes-caprae</i> (L.) Sweet	Convolvulaceae	Dic.	Ann.	2x = 30	144	4.79	72	10	15.7

Species ^b	Family	Class ^c	Life span ^d	chromosome number (2n) ^e	nuclear volume ^f (μm ³)	ICV ^g (μm ³)	Genome volume ^h (μm ³)	Est. 3C DNA ⁱ (pg)	Est. LD ₅₀ ^j (kR)
352. <i>I. purpurea</i> (L.) Roth cv. Early Call	Convolvulaceae	Dic.	Ann.	2x = 30	149	4.95	74	10	15.1
353. <i>I. purpurea</i> (L.) Roth cv. Scarlett O'Hara	Convolvulaceae	Dic.	Ann.	2x = 30	145	4.84	24	10	15.7
354. <i>Iris chamaeiris</i> Bert.	Iridaceae	Mon.	Per.	4x = 40	846	21.15	212	56	3.6
355. <i>I. croatica</i> I. & M. Horvat	Iridaceae	Mon.	Per.	4x = 48	758	15.78	379	51	4.7
356. <i>I. pseudacorus</i> L.	Iridaceae	Mon.	Per.	2x = 34 ^k	408	12.01	204	27	6.3
357. <i>I. pumila</i> L.	Iridaceae	Mon.	Per.	2x = 16	536	33.52	268	36	2.3
358. <i>Juncus effusus</i> L. var. <i>solutus</i> Fern. & Wieg. cv. Asanagi	Juncaceae	Mon.	Per.	4x = 40	72	1.79	18	5	42.0
359. <i>Kalanchoe daigremontiana</i> Hamet & Perrier	Crassulaceae	Dic.	Per.	2x = 34	67	1.97	33	5	37.8
360. <i>K. fedtschenkoi</i> Hamet & Perrier	Crassulaceae	Dic.	Per.	2x = 34 ^k	59	1.73	29	4	44.4
361. <i>K. X hybrida</i> Hort.	Crassulaceae	Dic.	Per.	3x = 51	104	2.04	35	7	37.8
362. <i>K. verticillata</i> S. Elliot	Crassulaceae	Dic.	Per.	4x = 68	70	1.03	18	5	75.6
363. <i>Kniphofia uvaria</i> (L.) Hook.	Liliaceae	Mon.	Per.	2x = 12	854	71.15	427	57	1.1
364. <i>Lactuca sativa</i> L. cv. Black Seeded Simpson	Compositae	Dic.	Ann.	2x = 18 ^k	148	8.24	74	10	9.2
365. <i>L. sativa</i> L. cv. Great Lakes	Compositae	Dic.	Ann.	2x = 18 ^k	177	9.82	88	12	7.7
366. <i>L. sativa</i> L. cv. Summer Bibb	Compositae	Dic.	Ann.	2x = 18	167	9.29	84	11	8.1
367. <i>Lathyrus odoratus</i> L.	Leguminosae	Dic.	Ann.	2x = 14	165	11.81	83	11	6.4
368. <i>Launaea pinnatifida</i> Cass	Compositae	Dic.	?	2x = 18	387	21.50	194	26	3.5
369. <i>Lemna perpusilla</i> Torr.	Lemnaceae	Mon.	Per.	4x = 44 ^k	60	1.36	15	4	54.0
370. <i>Lens culinaris</i> Medic.	Leguminosae	Dic.	Ann.	2x = 14	220	15.75	110	15	4.8
371. <i>Lepidium virginicum</i> L.	Cruciferae	Dic.	A,B	4x = 32	46	1.44	12	3	54.0
372. <i>Lilium formosanum</i> Wallace cv. Price	Liliaceae	Mon.	Per.	2x = 24	1469	61.22	735	98	1.2
373. <i>L. formosanum</i> Wallace cv. Wallace	Liliaceae	Mon.	Per.	2x = 24	1544	64.35	772	103	1.2
374. <i>L. formosanum</i> Wallace cv. Wilson	Liliaceae	Mon.	Per.	2x = 24	1783	74.28	891	119	1.0
375. <i>L. henryi</i> Baker	Liliaceae	Mon.	Per.	2x = 24	1236	51.49	618	83	1.5
376. <i>L. longiflorum</i> Thunb. cv. Ace	Liliaceae	Mon.	Per.	2x = 24 ^k	1201	50.04	600	80	1.5
377. <i>L. longiflorum</i> Thunb. cv. Croft	Liliaceae	Mon.	Per.	2x = 24 ^k	1304	54.32	652	87	1.4
378. <i>L. longiflorum</i> Thunb.	Liliaceae	Mon.	Per.	3x = 36	2452	68.12	817	164	1.1
379. <i>L. longiflorum</i> Thunb.	Liliaceae	Mon.	Per.	4x = 48	2985	62.19	746	200	1.2
380. <i>L. pumilum</i> DC.	Liliaceae	Mon.	Per.	2x = 24	1760	73.34	880	118	1.0
381. <i>L. regale</i> Wils.	Liliaceae	Mon.	Per.	2x = 24	1569	65.40	785	105	1.1
382. <i>L. superbum</i> L.	Liliaceae	Mon.	Per.	2x = 24	1737	72.36	868	116	1.1
383. <i>L. testaceum</i> Lindl.	Liliaceae	Mon.	Per.	2x = 24	1617	67.36	808	108	1.1
384. <i>L. willmottiae</i> Wils. X <i>L. leichtlinii</i> Hook. f. var. <i>maximowiczii</i> Baker cv. Maxwell	Liliaceae	Mon.	Per.	2x = 24	1150	47.91	575	77	1.6
385. <i>Linaria canadensis</i> (L.) Dum.	Scrophulariaceae	Dic.	A,B	2x = 12	48	3.99	24	3	18.9
386. <i>Linum grandiflorum</i> L.	Linaceae	Dic.	Ann.	2x = 16	86	5.38	43	6	14.0
387. <i>L. usitatissimum</i> L.	Linaceae	Dic.	Ann.	2x = 30	88	2.93	44	6	26.1
388. <i>Lobularia maritima</i> (L.) Desv.	Cruciferae	Dic.	Per.	3x = 24	56	2.34	19	4	32.9
389. <i>Lolium perenne</i> L.	Gramineae	Mon.	Per.	2x = 14	192	13.70	96	13	5.5
390. <i>Luffa cylindrica</i> Roem.	Cucurbitaceae	Dic.	Ann.	2x = 26	210	8.06	105	14	9.3
391. <i>Luzula parviflora</i> (Ehrh.) Desv.	Juncaceae	Mon.	Per.	8x = 24	65	2.70	8	4	28.0

Species ^b	Family	Class ^c	Life span ^d	Ploidy and chromosome number (2n) ^e	Nuclear volume ^f (μm ³)	ICV ^g (μm ³)	Genome volume ^h (μm ³)	Est. 3C DNA ⁱ (pg)	Est. LD50 ^j (KR)
392. <i>L. purpurea</i> Link	Juncaceae	Mon.	Per.	2x = 6	160	26.62	80	11	2.8
393. <i>Lychnis chalcidonica</i> L. var. <i>alba</i> Hort.	Caryophyllaceae	Dic.	Per.	2x = 24	197	8.23	99	13	9.2
394. <i>Lycopersicon esculentum</i> Mill. cv. Rutgers	Solanaceae	Dic.	Per.	2x = 24	144	6.01	72	10	12.6
395. <i>L. esculentum</i> Mill. cv. Shugyoku	Solanaceae	Dic.	Per.	2x = 24	179	7.44	89	12	10.2
396. <i>L. pimpinellifolium</i> Mill.	Solanaceae	Dic.	?	2x = 24	136	5.65	68	9	13.3
397. <i>Lycoris squamigera</i> Maxim.	Amaryllidaceae	Mon.	Per.	3x = 27	2064	76.46	688	138	1.0
398. <i>Maianthemum canadense</i> Desf.	Liliaceae	Mon.	Per.	2x = 36	630	17.51	315	42	4.3
399. <i>Mammillaria prolifera</i> Haw.	Cactaceae	Dic.	Per.	4x = 44 ^k	274	6.23	68	18	12.2
400. <i>Marrubium vulgare</i> L.	Labiatae	Dic.	Per.	2x = 34	105	3.09	53	7	24.4
401. <i>Matthiola bicornis</i> DC.	Cruciferae	Dic.	Ann.	2x = 14	84	5.99	42	6	12.6
402. <i>M. incana</i> (L.) R. Br.	Cruciferae	Dic.	B, P	2x = 14	77	5.49	38	5	13.7
403. <i>Medicago sativa</i> L.	Leguminosae	Dic.	Per.	2x = 16	134	8.39	67	9	9.0
404. <i>M. sativa</i> L.	Leguminosae	Dic.	Per.	4x = 32	169	5.29	42	11	14.3
405. <i>Mentha aquatica</i> L. var. <i>crispa</i> (L.) Benth.	Labiatae	Dic.	Per.	8x = 80 ^k	193	2.41	24	13	31.5
406. <i>M. arvensis</i> L.	Labiatae	Dic.	Per.	c. 10x = 104 ^k	263	2.53	c. 26	18	30.2
407. <i>M. X cordifolia</i> Opiz ex Fresen.	Labiatae	Dic.	Per.	c. 4x = 44 ^k	160	3.64	c. 40	11	21.0
408. <i>M. piperita</i> L.	Labiatae	Dic.	Per.	c. 6x = 66 ^k	167	2.53	c. 28	11	30.2
409. <i>M. spicata</i> L.	Labiatae	Dic.	Per.	c. 4x = 34 ^k	107	3.15	c. 27	7	23.6
410. <i>Mimosa pudica</i> L.	Leguminosae	Dic.	Per.	4x = 52	103	1.99	26	7	37.8
411. <i>Monotropa uniflora</i> L.	Ericaceae	Dic.	Per.	4x = 32	1271	39.72	318	85	1.9
412. <i>Muhlenbergia filiformis</i> (Thurb.) Rydb.	Gramineae	Mon.	Ann.	2x = 18	34	1.90	17	2	39.8
413. <i>Murdannia loriformis</i> (Hassk.) Rolla Rao & Kammathy	Commelinaceae	Mon.	Per.	4x = 40	245	6.13	61	16	12.4
414. <i>M. nudiflora</i> (L.) Brenan	Commelinaceae	Mon.	Per.	2x = 20 ^k	134	6.72	67	9	11.3
415. <i>M. nudiflora</i> (L.) Brenan	Commelinaceae	Mon.	Per.	4x = 40 ^k	266	6.66	67	18	11.3
416. <i>M. simplex</i> (Vahl) Brenan	Commelinaceae	Mon.	Per.	4x = 40 ^k	183	4.57	46	12	16.4
417. <i>M. simplex</i> (Vahl) Brenan cv. Agumbe	Commelinaceae	Mon.	Per.	c. 6x = 58 ^k	286	4.94	48	19	15.4
418. <i>Muscari armeniacum</i> Leicht.	Liliaceae	Mon.	Per.	4x = 36 ^k	496	13.78	124	33	5.5
419. <i>M. comosum</i> Mill.	Liliaceae	Mon.	Per.	2x = 18	296	16.43	148	20	4.6
420. <i>Narcissus cyclamineus</i> Baker	Amaryllidaceae	Mon.	Per.	2x = 14	568	40.55	284	38	1.9
421. <i>N. juncifolius</i> Req. ex Lag.	Amaryllidaceae	Mon.	Per.	2x = 14	544	38.86	272	36	1.9
422. <i>N. pseudo-narcissus</i> L. cv. King Alfred	Amaryllidaceae	Mon.	Per.	4x = 28	1789	63.89	447	120	1.2
423. <i>N. tazetta</i> L. cv. Paper White	Amaryllidaceae	Mon.	Per.	2x = 22	520	23.63	260	35	3.2
424. <i>N. triandrus</i> L. cv. Albus	Amaryllidaceae	Mon.	Per.	2x = 14	579	41.36	290	39	1.8
425. <i>N. watleri</i> Maire	Amaryllidaceae	Mon.	Per.	2x = 14	551	39.36	276	37	1.9
426. <i>Nelumbo lutea</i> (Willd.) Pers.	Nymphaeaceae	Dic.	Per.	2x = 16	118	7.39	59	8	10.2
427. <i>Nemophila menziesii</i> Hook. & Arn.	Hydrophyllaceae	Dic.	Ann.	2x = 18	113	6.27	56	8	12.0
428. <i>Neomarica gracilis</i> Sprague	Iridaceae	Mon.	Per.	2x = 18 ^k	200	11.11	100	13	6.8
429. <i>Nicotiana bigelovii</i> S. Wats.	Solanaceae	Dic.	Ann.	4x = 48	283	5.89	71	19	12.8
430. <i>N. bigelovii</i> S. Wats. X <i>N. debneyi</i> Domin. X <i>N. tabacum</i> L.	Solanaceae	Dic.	?	c. 9x = 112	732	6.54	c. 81	49	11.6
431. <i>N. glauca</i> Graham	Solanaceae	Dic.	Per.	2x = 24	249	10.36	124	17	7.3
432. <i>N. glauca</i> Graham X <i>N. bigelovii</i> S. Wats.	Solanaceae	Dic.	?	3x = 36	384	10.68	128	26	7.1

Table 5 (cont.)

Species ^b	Family	Class ^c	Life span ^d	Ploidy and chromosome number (2n) ^e	Nuclear volume ^f (μm^3)	ICy8 (μm^3)	Genome volume ^h (μm^3)	Est. 3C DNA ⁱ (pg)	Est. LD50 ^j (KR)
433. <i>N. glauca</i> Graham X <i>N. langsdorffii</i> Schrank	Solanaceae	Dic.	?	c. 4x = 42	320	7.61	c. 80	21	9.9
434. <i>N. glutinosa</i> L. X <i>N. glauca</i> Graham	Solanaceae	Dic.	?	4x = 48	322	6.71	81	22	11.3
435. <i>N. langsdorffii</i> Schrank	Solanaceae	Dic.	Ann.	2x = 18	156	8.68	78	10	8.7
436. <i>N. rustica</i> L.	Solanaceae	Dic.	Ann.	4x = 48	202	4.21	50	14	18.0
437. <i>N. X sanderac</i> Hort. ex Gard. (variegated derivative)	Solanaceae	Dic.	Ann.	2x = 18	162	8.99	81	11	8.4
438. <i>N. X sanderac</i> Hort. ex Gard. X <i>N. langsdorffii</i> Schrank	Solanaceae	Dic.	Ann.	4x = 36	301	8.35	75	20	9.0
439. <i>N. tabacum</i> L. (6290 Short)	Solanaceae	Dic.	Ann.	4x = 48	343	7.14	86	23	10.6
440. <i>N. tabacum</i> L. (6291 Tall)	Solanaceae	Dic.	Ann.	4x = 48	292	6.09	73	20	12.4
441. <i>N. tabacum</i> L. cv. Wisconsin 38	Solanaceae	Dic.	Ann.	4x = 48	425	8.86	106	28	8.5
442. <i>Nigella damascena</i> L. cv. Miss Jekyll	Ranunculaceae	Dic.	Ann.	2x = 12	379	31.55	189	25	2.4
443. <i>N. sativa</i> L.	Ranunculaceae	Dic.	Ann.	2x = 12	414	34.49	207	28	2.2
444. <i>Nuphar advena</i> (Ait.) Ait. f.	Nymphaeaceae	Dic.	Per.	2x = 34	352	10.36	176	24	7.3
445. <i>N. sagittifolium</i> (Walt.) Pursh	Nymphaeaceae	Dic.	Per.	2x = 34	394	11.60	197	26	6.5
446. <i>Nymphaea capensis</i> Thunb. var. <i>zanzibariensis</i> Casp.	Nymphaeaceae	Dic.	Per.	2x = 28	90	3.20	45	6	23.6
447. <i>N. gigantea</i> Hook.	Nymphaeaceae	Dic.	Per.	2x = c. 22 ^k	74	c. 3.36	37	5	22.2
448. <i>N. tuberosa</i> Paine var. <i>maxima</i>	Nymphaeaceae	Dic.	Per.	6x = 84	114	1.36	19	8	54.0
449. <i>Oenothera biennis</i> L.	Onagraceae	Dic.	Bi.	2x = 14	168	12.01	84	11	6.3
450. <i>Ornithogalum virens</i> Lindl.	Liliaceae	Mon.	Per.	2x = 6	317	52.78	158	21	1.4
451. <i>Oryza sativa</i> L. (8970-S)	Gramineae	Mon.	Ann.	2x = 24	74	3.07	37	5	24.4
452. <i>O. sativa</i> L. cv. Nohrin No. 8	Gramineae	Mon.	Ann.	2x = 24	77	3.19	38	5	23.6
453. <i>O. sativa</i> L. cv. Zenith	Gramineae	Mon.	Ann.	2x = 24	71	2.98	36	5	25.2
454. <i>Oxalis martiana</i> Zucc.	Oxalidaceae	Dic.	Per.	2x = 14	91	6.49	45	6	11.6
455. <i>O. stricta</i> L.	Oxalidaceae	Dic.	Per.	4x = 24	112	4.68	28	8	16.1
456. <i>Paeonia</i> sp. cv. Felix Crousse	Ranunculaceae	Dic.	Per.	2x = 10 ^k	368	36.76	184	25	2.1
457. <i>Palisota albertii</i> L. Gentil	Commelinaceae	Mon.	Per.	4x = 40 ^k	611	15.28	153	41	4.9
458. <i>P. barteri</i> Hook. f.	Commelinaceae	Mon.	Per.	8x = 80 ^k	886	11.07	111	59	6.8
459. <i>P. elizabethae</i> L. Gentil	Commelinaceae	Mon.	Per.	4x = 40 ^k	554	13.85	138	37	5.4
460. <i>Papaver nudicaule</i> L.	Papaveraceae	Dic.	Per.	2x = 14	121	8.61	60	8	8.8
461. <i>P. rhoeas</i> L.	Papaveraceae	Dic.	Ann.	2x = 14	156	11.13	78	10	6.8
462. <i>Paspalum dilatatum</i> Poir.	Gramineae	Mon.	Per.	4x = 40	116	2.90	29	8	26.1
463. <i>P. dilatatum</i> Poir.	Gramineae	Mon.	Per.	5x = 50	147	2.94	29	10	26.1
464. <i>P. distichum</i> L.	Gramineae	Mon.	Per.	6x = 60	110	1.84	18	7	42.0
465. <i>P. floridanum</i> Michx.	Gramineae	Mon.	Per.	18x = 180	592	3.29	33	40	22.9
466. <i>P. urvillei</i> Steud.	Gramineae	Mon.	Per.	4x = 40	108	2.71	27	7	28.0
467. <i>Pastinaca sativa</i> L.	Umbelliferae	Dic.	Bi.	2x = 22	154	7.00	77	10	10.8
468. <i>Pelargonium</i> sp.	Geraniaceae	Dic.	Per.	1x = 9 ^k	80	8.94	80	5	8.5
469. <i>P. sp.</i> cv. Mamie	Geraniaceae	Dic.	Per.	4x = 36 ^k	274	7.62	69	18	9.9
470. <i>P. sp.</i> cv. Purple Heart	Geraniaceae	Dic.	Per.	2x = 18 ^k	156	8.69	78	11	8.7
471. <i>Peltandra virginica</i> (L.) Schott & Endl.	Araceae	Mon.	Per.	10x = 110 ^k	504	4.58	50	34	16.4
472. <i>Pennisetum glaucum</i> R. Br.	Gramineae	Mon.	Ann.	2x = 14	149	10.62	74	10	7.1
473. <i>Perilla frutescens</i> Britt.	Labiatae	Dic.	Ann.	?x = 40 ^k	227	5.68	—	15	13.3
474. <i>Petroselinum crispum</i> (Mill.) Mansfeld	Umbelliferae	Dic.	Bi.	2x = 22 ^k	102	4.62	51	7	16.4

Species ^b	Family	Class ^c	Life span ^d	Ploidy and chromosome number (2n) ^e	Nuclear volume ^f (μm^3)	ICV8 (μm^3)	Genome volume ^h (μm^3)	Est. 3C DNA ⁱ (pg)	Est. LD ₅₀ ^j (kR)
475. <i>Phalaris tuberosa</i> L. var. <i>stenoptera</i> (Hack.) Hitchc.	Gramineae	Mon.	Per.	4x = 28	316	11.27	79	21	6.7
476. <i>Pharbitis nil</i> Choisy	Convolvulaceae	Dic.	Per.	2x = 30	259	8.64	130	17	8.8
477. <i>Phaseolus aureus</i> Roxb.	Leguminosae	Dic.	Ann.	2x = 22 ^k	108	4.92	54	7	15.4
478. <i>P. limensis</i> Macf.	Leguminosae	Dic.	Per.	2x = 22	151	6.88	76	10	11.0
479. <i>P. vulgaris</i> L. cv. Kentucky Wonder	Leguminosae	Dic.	Ann.	2x = 22	167	7.59	84	11	9.9
480. <i>P. vulgaris</i> L. cv. Pencil Pod Black Wax	Leguminosae	Dic.	Ann.	2x = 22	122	5.55	61	8	13.5
481. <i>P. vulgaris</i> L. cv. Topcrop	Leguminosae	Dic.	Ann.	2x = 22	191	8.67	95	13	8.7
482. <i>P. vulgaris</i> L. cv. Surecrop Stringless	Leguminosae	Dic.	Ann.	2x = 22	131	5.96	66	9	12.6
483. <i>Phleum pratense</i> L.	Gramineae	Mon.	Per.	6x = 42	261	6.22	44	18	12.2
484. <i>Phlox divaricata</i> L.	Polemoniaceae	Dic.	Per.	2x = 14	213	15.22	107	14	5.0
485. <i>Pisum sativum</i> L. cv. Alaska	Leguminosae	Dic.	Ann.	2x = 14	313	22.38	157	21	3.4
486. <i>P. sativum</i> L. cv. Alderman	Leguminosae	Dic.	Ann.	2x = 14	333	23.78	166	22	3.2
487. <i>P. sativum</i> L. cv. Oracle	Leguminosae	Dic.	Ann.	2x = 14	212	15.13	106	14	5.0
488. <i>P. sativum</i> L. var. <i>arvense</i> Poir.	Leguminosae	Dic.	Ann.	2x = 14	233	16.62	116	16	4.6
489. <i>Plantago insularis</i> Eastw.	Plantaginaceae	Dic.	Ann.	2x = 8 ^k	102	12.81	51	7	5.9
490. <i>P. major</i> L.	Plantaginaceae	Dic.	Per.	2x = 12	92	7.63	46	6	9.9
491. <i>P. ovata</i> Forsk.	Plantaginaceae	Dic.	Ann.	2x = 8	90	11.23	45	6	6.8
492. <i>Podophyllum peltatum</i> L.	Berberidaceae	Dic.	Per.	2x = 12	1240	103.37	620	83	0.7
493. <i>Portulaca grandiflora</i> Hook.	Portulacaceae	Dic.	Ann.	2x = 18	130	7.20	65	9	10.5
494. <i>P. grandiflora</i> Hook. cv. <i>Coccinea</i>	Portulacaceae	Dic.	Ann.	2x = 18	112	6.24	56	8	12.2
495. <i>P. oleracea</i> L.	Portulacaceae	Dic.	Ann.	6x = 54	108	2.00	18	7	37.8
496. <i>Ranunculus</i> sp. cv. Tecolote Giant	Ranunculaceae	Dic.	Per.	2x = 16 ^k	417	25.08	209	28	2.9
497. <i>R. bulbosus</i> L.	Ranunculaceae	Dic.	Per.	4x = 32 ^k	334	10.45	84	22	7.2
498. <i>R. repens</i> L.	Ranunculaceae	Dic.	Per.	4x = 32 ^k	367	11.48	92	25	6.6
499. <i>Raphanus raphanistrum</i> L.	Cruciferae	Dic.	Ann.	2x = 18	67	3.70	33	5	20.4
500. <i>R. sativus</i> L. cv. Cherry Belle	Cruciferae	Dic.	A,B	2x = 18	191	5.62	51	7	13.5
501. <i>R. sativus</i> L. cv. Nerima	Cruciferae	Dic.	A,B	2x = 18	93	5.15	46	6	14.5
502. <i>R. sativus</i> L. cv. Scarlet Turnip	Cruciferae	Dic.	A,B	2x = 18	84	4.65	42	6	16.1
503. <i>R. sativus</i> L. var. <i>acanthiformis</i> cv. Tokyo-Minowase	Cruciferae	Dic.	A,B	2x = 18	79	4.41	40	5	17.2
504. <i>Rheum rhaponticum</i> L.	Polygonaceae	Dic.	Per.	4x = 44	342	7.78	86	23	9.7
505. <i>Rhinanthus crista-galli</i> L.	Scrophulariaceae	Dic.	Ann.	2x = 14	185	13.23	93	12	5.7
506. <i>Rhoeo spathacea</i> (Sw.) Stearn	Commelinaceae	Mon.	Per.	2x = 12 ^k	406	33.82	203	27	2.2
507. <i>Ricinus communis</i> L.	Euphorbiaceae	Dic.	Ann.	2x = 20	108	5.39	54	7	14.0
508. <i>Rumex acetosa</i> L.	Polygonaceae	Dic.	Per.	2x = 14, 15 ^k	198	13.62	99	13	5.6
509. <i>R. acetosella</i> L.	Polygonaceae	Dic.	Per.	6x = 42 ^k	284	6.77	47	19	11.1
510. <i>R. alpinus</i> L.	Polygonaceae	Dic.	Per.	2x = 20 ^k	112	5.59	56	8	13.5
511. <i>R. altissimus</i> Wood	Polygonaceae	Dic.	Per.	2x = 20 ^k	98	4.91	49	7	15.4
512. <i>R. aquaticus</i> L.	Polygonaceae	Dic.	Per.	14x = 140 ^k	540	3.86	39	36	19.4
513. <i>R. aquaticus</i> L. var. <i>maxima</i> (uncertain) ^l	Polygonaceae	Dic.	Per.	6x = 60 ^k	211	3.51	35	14	21.6
514. <i>R. aquaticus</i> L. ssp. <i>euaquaticus</i> (uncertain)	Polygonaceae	Dic.	Per.	6x = 60 ^k	287	4.78	48	19	15.7
515. <i>R. arcticus</i> Trautv.	Polygonaceae	Dic.	Per.	12x = 120 ^k	549	4.57	46	37	16.4
516. <i>R. bucephalophorus</i> L. ssp. <i>bucephalophorus</i>	Polygonaceae	Dic.	Ann.	2x = 16 ^k	197	12.30	98	13	6.1
517. <i>R. confertus</i> Willd.	Polygonaceae	Dic.	Per.	10x = 100 ^k	382	3.32	38	25	19.9

Table 5 (cont.)

Species ^b	Family	Class ^c	Life span ^d	Ploidy and chromosome number(2n) ^e	Nuclear volume ^f (μm ³)	ICVB (μm ³)	Genome volume ^h (μm ³)	Est. 3C DNA ⁱ (pg)	Est. LD ₅₀ ^j (kR)
518. <i>R. conglomeratus</i> Murray	Polygonaceae	Dic.	Per.	2x = 20k	97	4.86	49	7	15.4
519. <i>R. crispus</i> L.	Polygonaceae	Dic.	Per.	6x = 60k	203	3.38	34	14	22.2
520. <i>R. cristatus</i> DC.	Polygonaceae	Dic.	Per.	8x = 80k	343	4.30	43	23	17.6
521. <i>R. crystallinus</i> Lange	Polygonaceae	Dic.	Per.	6x = 60k	119	1.99	20	8	37.8
522. <i>R. dentatus</i> L.	Polygonaceae	Dic.	Ann.	4x = 40k	140	3.49	35	9	21.6
523. <i>R. flexuosus</i> Soland. ex Forst. f.	Polygonaceae	Dic.	Per.	4x = 40k	144	3.60	36	10	21.0
524. <i>R. frutescens</i> Thouars	Polygonaceae	Dic.	Per.	16x = 160k	639	3.99	40	43	18.9
525. <i>R. hydrolapathum</i> Huds.	Polygonaceae	Dic.	Per.	20x = 200k	664	3.32	33	44	22.9
526. <i>R. hymenosepalus</i> Torr.	Polygonaceae	Dic.	Per.	4x = 40k	152	3.79	38	10	19.9
527. <i>R. japonicus</i> Moutt.	Polygonaceae	Dic.	Per.	10x = 100k	348	3.48	35	23	21.6
528. <i>R. longifolius</i> DC.	Polygonaceae	Dic.	Per.	6x = 60k	232	3.87	39	16	19.4
529. <i>R. maritimus</i> L.	Polygonaceae	Dic.	Ann.	4x = 40k	128	3.19	32	9	23.6
530. <i>R. maximus</i> Schreb.	Polygonaceae	Dic.	Per.	9x = 90k	285	3.16	32	19	23.6
531. <i>R. nepalensis</i> Spreng.	Polygonaceae	Dic.	Per.	12x = 120k	461	3.84	38	31	19.9
532. <i>R. nipponicus</i> Franch. & Savat.	Polygonaceae	Dic.	?	4x = 40k	196	4.91	49	13	15.4
533. <i>R. obtusifolius</i> L.	Polygonaceae	Dic.	Per.	4x = 40k	148	3.70	37	10	20.4
534. <i>R. obtusifolius</i> L. ssp. <i>obtusifolius</i>	Polygonaceae	Dic.	Per.	4x = 40k	182	4.55	46	12	16.4
535. <i>R. obtusifolius</i> L. ssp. <i>sylvestris</i> (Wallr.) Rech.	Polygonaceae	Dic.	Per.	4x = 40k	154	3.85	38	10	19.4
536. <i>R. obtusifolius</i> L. ssp. <i>transiens</i> (Simonkai) Rech. f.	Polygonaceae	Dic.	Per.	4x = 40k	173	4.32	43	12	17.6
537. <i>R. occidentalis</i> Wats.	Polygonaceae	Dic.	Per.	14x = 140k	659	4.71	47	44	16.1
538. <i>R. orbiculatus</i> Gray	Polygonaceae	Dic.	Per.	16x = 160k	606	3.79	38	41	19.9
539. <i>R. orbiculatus</i> Gray	Polygonaceae	Dic.	Per.	17x = 170k	629	3.70	37	42	20.4
540. <i>R. orbiculatus</i> Gray	Polygonaceae	Dic.	Per.	18x = 180k	640	3.56	36	43	21.0
541. <i>R. pallidus</i> Bigel.	Polygonaceae	Dic.	Per.	2x = 20k	106	5.32	53	7	14.3
542. <i>R. palustris</i> Sm.	Polygonaceae	Dic.	Ann.	6x = 60k	213	3.55	35	14	21.0
543. <i>R. patientia</i> L. ssp. <i>callosus</i> (F. Schmidt) Rech. f.	Polygonaceae	Dic.	Per.	6x = 60k	247	4.12	41	17	18.4
544. <i>R. patientia</i> L. ssp. <i>orientalis</i> (Bernh.) Danser	Polygonaceae	Dic.	Per.	6x = 60k	306	5.09	51	20	14.8
545. <i>R. patientia</i> L. ssp. <i>pamiricus</i> Rech. f.	Polygonaceae	Dic.	Per.	6x = 60k	206	3.44	34	14	22.2
546. <i>R. patientia</i> L. ssp. <i>patientia</i>	Polygonaceae	Dic.	Per.	6x = 60k	187	5.11	31	13	24.4
547. <i>R. pseudonatronatus</i> Borbas	Polygonaceae	Dic.	Per.	4x = 40k	155	3.88	39	10	19.4
548. <i>R. pulcher</i> L. ssp. <i>anodontus</i> (Hausskn.) Rech. f.	Polygonaceae	Dic.	Per.	2x = 20k	98	4.92	49	7	15.4
549. <i>R. pulcher</i> L. ssp. <i>pulcher</i>	Polygonaceae	Dic.	Per.	2x = 20k	108	5.40	54	77	14.0
550. <i>R. salicifolius</i> Weinm. ssp. <i>salicifolius</i>	Polygonaceae	Dic.	Per.	2x = 20k	82	4.09	41	6	18.4
551. <i>R. salicifolius</i> Weinm. ssp. <i>salicifolius</i> var. <i>montigenitus</i> Jeps.	Polygonaceae	Dic.	Per.	2x = 20k	82	4.09	41	6	18.4
552. <i>R. salicifolius</i> Weinm. ssp. <i>triangulivalvis</i> Danser var. <i>triangulivalvis</i>	Polygonaceae	Dic.	Per.	2x = 20k	70	3.52	35	5	21.6
553. <i>R. sanguineus</i> L.	Polygonaceae	Dic.	Per.	2x = 20k	99	4.93	49	7	15.4
554. <i>R. scutatus</i> L.	Polygonaceae	Dic.	Per.	2x = 20k	142	7.21	71	10	10.6
555. <i>R. stenophyllus</i> Ledeb.	Polygonaceae	Dic.	Per.	6x = 60k	166	2.77	28	11	27.0
556. <i>R. tenax</i> Rech. f.	Polygonaceae	Dic.	Per.	8x = 80k	206	2.58	26	14	29.1
557. <i>R. thyrsiflorus</i> Fingerh.	Polygonaceae	Dic.	Per.	2x = 14, 15 k	198	c.13.63	99	13	5.6

Table 5 (cont.)

Species ^b	Family	Class ^c	Life span ^d	Ploidy and chromosome number (2n) ^e	Nuclear volume ^f (μm^3)	ICVB (μm^3)	Genome volume ^h (μm^3)	Est. 3C DNA ⁱ (pg)	Est. LD50 ^j (kR)
558. <i>R. tianschanicus</i> Los.-Losinsk. (uncertain)	Polygonaceae	Dic.	?	2x = 20 ^k	133	6.66	67	9	11.3
559. <i>R. verticillatus</i> L.	Polygonaceae	Dic.	Per.	6x = 60 ^k	172	2.86	29	12	26.1
560. <i>R. vesicarius</i> L.	Polygonaceae	Dic.	Ann.	2x = 18 ^k	207	11.49	103	14	6.6
561. <i>Saccharum officinarum</i> L.	Gramineae	Mon.	Per.	10x = 104 ^k	587	5.64	59	39	13.5
562. <i>Sagittaria latifolia</i> Willd.	Alismaceae	Mon.	Per.	2x = 22 ^k	412	18.74	206	28	4.0
563. <i>S. sagittifolia</i> L.	Alismaceae	Mon.	Per.	2x = 22 ^k	616	28.01	308	41	2.7
564. <i>Saintpaulia ionantha</i> Wendl. cv. Fantasy Blue	Gesneriaceae	Dic.	Per.	2x = 28	99	3.55	50	7	21.0
565. <i>Salsola kali</i> L.	Chenopodiaceae	Dic.	Ann.	4x = 36 ^k	176	4.89	44	12	15.4
566. <i>Salvia horminum</i> L.	Labiatae	Dic.	Ann.	2x = 16	92	5.77	46	6	13.0
567. <i>S. sclarea</i> L. var. <i>turkestaniana</i> Mott.	Labiatae	Dic.	Bl.	2x = 22	105	4.79	53	7	15.7
568. <i>S. splendens</i> Ker cv. St. John's Fire	Labiatae	Dic.	Per.	4x = 32	91	2.84	23	6	27.0
569. <i>Scilla hispanica</i> Mill. cv. Blue Queen	Liliaceae	Mon.	Per.	2x = 16	877	54.83	439	59	1.4
570. <i>S. sibirica</i> Haw. cv. Alba	Liliaceae	Mon.	Per.	2x = 12	995	82.92	498	67	0.9
571. <i>Secale africanum</i> Stapf	Gramineae	Mon.	Per.	2x = 14	356	25.45	178	24	3.0
572. <i>S. cereale</i> L. cv. Abruzzi	Gramineae	Mon.	Ann.	2x = 14	267	19.04	133	18	4.0
573. <i>S. cereale</i> L. cv. Merced	Gramineae	Mon.	Ann.	2x = 14	313	22.35	156	21	3.4
574. <i>S. cereale</i> L. cv. Prolific	Gramineae	Mon.	Ann.	2x = 14	310	22.12	155	21	3.4
575. <i>S. cereale</i> L. cv. Svalof	Gramineae	Mon.	Ann.	4x = 28	698	24.93	175	47	3.0
576. <i>Sedum acre</i> L.	Crassulaceae	Dic.	Per.	?x = 48	90	1.88	—	6	39.8
577. <i>S. aizoon</i> L.	Crassulaceae	Dic.	Per.	?x = 128	305	2.38	—	20	31.5
578. <i>S. alboroseum</i> Baker	Crassulaceae	Dic.	Per.	12x = 48	87	1.81	7	6	42.0
579. <i>S. album</i> L.	Crassulaceae	Dic.	Per.	?x = 68	50	0.74	—	3	107.9
580. <i>S. album</i> L. ssp. <i>gypsicolum</i> (Boiss. & Reut.) Maire	Crassulaceae	Dic.	Per.	c. 10x = 102	76	0.74	c. 8	5	107.9
581. <i>S. alfredi</i> Hance var. <i>nagasakiense</i>	Crassulaceae	Dic.	Per.	?x = 128	83	0.65	—	6	107.9
582. <i>S. ellacombianum</i> Praeger	Crassulaceae	Dic.	Per.	?x = 54 ^k	145	2.68	—	10	28.0
583. <i>S. glaucophyllum</i> Clausen	Crassulaceae	Dic.	Per.	?x = 28	95	3.40	—	6	22.2
584. <i>S. guatemalense</i> Hemsl.	Crassulaceae	Dic.	Per.	?x = 63	53	0.84	—	4	94.4
585. <i>S. kamschaticum</i> Fisch. & Mey.	Crassulaceae	Dic.	Per.	?x = 48	134	2.78	—	9	27.0
586. <i>S. middendorffianum</i> Maxim.	Crassulaceae	Dic.	Per.	?x = 32 ^k	93	2.90	—	6	26.1
587. <i>S. nevillei</i> Gray	Crassulaceae	Dic.	Per.	2x = 12	58	4.84	29	4	15.7
588. <i>S. oryzifolium</i> Makino	Crassulaceae	Dic.	Per.	?x = 20	43	2.16	—	3	34.3
589. <i>S. pachyphyllum</i> Rose	Crassulaceae	Dic.	Per.	?x = 64	123	1.93	—	8	39.8
590. <i>S. rupifragum</i> Koidz.	Crassulaceae	Dic.	Per.	?x = 136	90	0.66	—	6	107.9
591. <i>S. spectabile</i> Boreau	Crassulaceae	Dic.	Per.	?x = 51	80	1.57	—	5	47.2
592. <i>S. ternatum</i> Michx.	Crassulaceae	Dic.	Per.	2x = 16	168	10.50	84	11	7.2
593. <i>S. ternatum</i> Michx.	Crassulaceae	Dic.	Per.	4x = 32	149	4.64	—	10	16.4
594. <i>S. tricarpum</i> Makino	Crassulaceae	Dic.	Per.	?x = 128	99	0.77	—	7	94.4
595. <i>Sempervivum tectorum</i> L.	Crassulaceae	Dic.	Per.	4x = 72	70	0.98	18	5	75.6
596. <i>Senecio vulgaris</i> L.	Compositae	Dic.	Ann.	8x = 40	199	4.98	25	13	15.1
597. <i>Seperotheca pumila</i> (Greene) Waterfall	Commelinaceae	Mon.	Per.	?x = 36 ^k	1025	28.76	—	69	2.6
598. <i>Sesamum indicum</i> L.	Pedaliaceae	Dic.	Ann.	2x = 26	122	4.69	61	8	16.1
599. <i>Setaria glauca</i> (L.) Beauv.	Gramineae	Mon.	Ann.	4x = 36	205	5.71	51	14	13.3
600. <i>Setcreasea brevifolia</i> (Rose) Rose	Commelinaceae	Mon.	Per.	4x = 24 ^k	1375	57.28	344	92	1.3
601. <i>S. hirsuta</i> Markgraf	Commelinaceae	Mon.	Per.	4x = 24	858	35.75	215	57	2.1

Table 5 (cont.)

Species ^b	Family	Class ^c	Life span ^d	Ploidy and chromosome number (2n) ^e	Nuclear volume ^f (μm^3)	ICV8 (μm^3)	Genome volume ^h (μm^3)	Est. 3C DNA ⁱ (pg)	Est. LD50 ^j (kR)
602. <i>S. lanceolata</i> Faruqi, Mehra & Celar.	Commelinaceae	Mon.	Per.	4x = 24k	1028	42.84	257	69	1.8
603. <i>S. leiandra</i> (Torr.) Pilger	Commelinaceae	Mon.	Per.	2x = 12	574	47.80	287	38	1.6
604. <i>S. ovata</i> (Coulter) Faruqi, Celar. & Mehra	Commelinaceae	Mon.	Per.	4x = 24k	1198	49.90	299	80	1.5
605. <i>S. purpurea</i> Boom.	Commelinaceae	Mon.	Per.	4x = 24k	1020	42.51	255	68	1.8
606. <i>S. purpurea</i> Boom. X <i>S. brevifolia</i> (Rose) Rose	Commelinaceae	Mon.	Per.	4x = 24k	1248	52.00	312	84	1.5
607. <i>S. purpurea</i> Boom. X <i>S. ovata</i> (Coulter) Faruqi, Celar. & Mehra	Commelinaceae	Mon.	Per.	c. 4x = 21k	678	32.31	c. 170	45	2.3
608. <i>Siderasis fuscata</i> (Lodd.) H. E. Moore	Commelinaceae	Mon.	Per.	2x = 38k	670	17.62	335	45	4.3
609. <i>Silene nivea</i> (Nutt.) Orth	Caryophyllaceae	Dic.	Per.	2x = 24k	244	10.16	122	16	7.4
610. <i>Solanum gsoha</i>	Solanaceae	Dic.	Per.	4x = 48k	185	3.85	46	12	19.4
611. <i>S. melongena</i> L. cv. Foremost	Solanaceae	Dic.	Per.	2x = 24k	120	5.00	60	8	15.1
612. <i>S. melongena</i> L. cv. Shinkissin	Solanaceae	Dic.	Per.	2x = 24	192	8.00	96	13	9.4
613. <i>S. tuberosum</i> L. cv. Katahdin	Solanaceae	Dic.	Per.	4x = 48	223	4.64	56	15	16.4
614. <i>Solidago juncea</i> Alt.	Compositae	Dic.	Per.	2x = 18	105	5.86	53	7	12.8
615. <i>S. nemoralis</i> Ait.	Compositae	Dic.	Per.	2x = 18	322	17.89	161	22	4.2
616. <i>S. puberula</i> Nutt.	Compositae	Dic.	Per.	2x = 18	126	7.02	63	9	10.8
617. <i>S. sempervirens</i> L.	Compositae	Dic.	Per.	2x = 18	195	10.85	98	13	6.9
618. <i>Sorghum vulgare</i> Pers. var. <i>bicolor</i> Eaton & Wright	Gramineae	Mon.	Ann.	2x = 20	108	5.38	54	7	14.0
619. <i>S. vulgare</i> Pers. var. <i>caffrorum</i> (Retz.) Hubb. & Rehd.	Gramineae	Mon.	Ann.	2x = 20	113	5.63	56	8	13.5
620. <i>Spartina pectinata</i> Link	Gramineae	Mon.	Per.	4x = 28	224	7.99	56	15	9.4
621. <i>Spergularia rubra</i> (L.) J. & C. Presl.	Caryophyllaceae	Dic.	A, P	4x = 36	77	2.14	19	5	36.0
622. <i>Spinacia oleracea</i> L. cv. Bloomsdale Long Standing	Chenopodiaceae	Dic.	Ann.	2x = 12	115	9.57	57	8	7.9
623. <i>S. oleracea</i> L. cv. Dark Green Bloomsdale	Chenopodiaceae	Dic.	Ann.	2x = 12	115	9.62	58	8	7.9
624. <i>S. oleracea</i> L. cv. Ujyo	Chenopodiaceae	Dic.	Ann.	2x = 12	130	10.84	65	9	7.0
625. <i>S. oleracea</i> L. var. <i>inermis</i> Peterm. cv. Old Dominion	Chenopodiaceae	Dic.	Ann.	2x = 12	135	11.27	68	9	6.7
626. <i>Spiranthes cernua</i> (L.) Rich.	Orchidaceae	Mon.	Per.	6x = 60k	429	7.15	72	29	10.5
627. <i>Sporobolus cryptandrus</i> (Torr.) A. Gray	Gramineae	Mon.	Per.	4x = 36	155	4.32	39	10	17.6
628. <i>S. heterolepis</i> (A. Gray) A. Gray	Gramineae	Mon.	Per.	8x = 72	134	1.86	17	9	39.9
629. <i>Sprekelia formosissima</i> Herbert	Amoryllidaceae	Mon.	Per.	3x = 121k	4453	36.80	—	298	2.1
630. <i>Stapelia variegata</i> L.	Asclepiadaceae	Dic.	Per.	4x = 44	153	3.47	38	10	21.6
631. <i>Stipa spartea</i> Trin.	Gramineae	Mon.	Per.	4x = c. 44	210	c. 4.77	53	14	15.7
632. <i>Streptopus roseus</i> Michx.	Liliaceae	Mon.	Per.	2x = 16	215	13.44	108	14	5.6
633. <i>Tagetes patula</i> L. cv. Petite Harmony	Compositae	Dic.	Ann.	4x = 48k	323	6.72	81	22	11.3
634. <i>Teucrium chamaedrys</i> L.	Labiatae	Dic.	Per.	8x = 64	228	3.56	28	15	21.0
635. <i>Thalictrum dipterocarpum</i> Fran.	Ranunculaceae	Dic.	Per.	4x = 28	173	6.18	43	12	12.2
636. <i>Thymus serpyllum</i> L.	Labiatae	Dic.	Per.	4x = 24	117	4.89	29	8	15.4
637. <i>Thysantherum floribundum</i> (Mart. & Gal.) Pichon	Commelinaceae	Mon.	Per.	4x = 30k	424	13.24	106	28	5.7

Table 5 (cont.)

Species ^b	Family	Class ^c	Life span ^d	Ploidy and chromosome number (2n) ^e	Nuclear volume ^f (μm ³)	ICyB (μm ³)	Genome volume ^h (μm ³)	Est. 3C DNA ⁱ (pg)	Est. LD50 ^j (kR)
638. <i>Tigridia pavonia</i> Ker	Iridaceae	Mon.	Per.	2x = 28 ^k	500	17.86	250	33	4.2
639. <i>Tinantia erecta</i> (Jacq.) Schlecht.	Commelinaceae	Mon.	Ann.	4x = 68 ^k	518	7.62	129	35	9.9
640. <i>Tradescantia</i> sp. clone 02	Commelinaceae	Mon.	Per.	2x = 12 ^k	809	67.39	404	54	1.1
641. <i>T. blossfeldiana</i> Mildbr.	Commelinaceae	Mon.	Per.	c. 12x = 70 ^k	547	7.82	c. 46	37	9.7
642. <i>T. bracteata</i> Small	Commelinaceae	Mon.	Per.	2x = 12 ^k	904	75.34	452	60	1.0
643. <i>T. bracteata</i> Small	Commelinaceae	Mon.	Per.	4x = 24 ^k	1216	50.66	304	81	1.5
644. <i>T. bracteata</i> Small cv. Red Cloud	Commelinaceae	Mon.	Per.	2x = 12 ^k	684	57.01	342	46	1.3
645. <i>T. commelinoides</i> Schult. f.	Commelinaceae	Mon.	Per.	2x = 16 ^k	621	38.80	310	42	2.0
x = 8(?)									
646. <i>T. commelinoides</i> Schult. f.	Commelinaceae	Mon.	Per.	c. 4x = 22	572	25.99	c. 143	38	2.9
x = 6(?)									
647. <i>T. commelinoides</i> Schult. f.	Commelinaceae	Mon.	Per.	c. 5x = 29 ^k	918	31.64	c. 184	61	2.4
x = 6(?)									
648. <i>T. commelinoides</i> Schult. f.	Commelinaceae	Mon.	Per.	6x = 36 ^k	539	14.97	90	36	5.2
x = 6(?)									
649. <i>T. crassifolia</i> Cav.	Commelinaceae	Mon.	Per.	2x = 12 ^k	480	40.01	240	32	1.9
650. <i>T. crassifolia</i> Cav.	Commelinaceae	Mon.	Per.	3x = 18 ^k	677	37.58	226	45	2.0
651. <i>T. crassifolia</i> Cav.	Commelinaceae	Mon.	Per.	4x = 24 ^k	791	32.97	198	53	2.3
652. <i>T. crassifolia</i> Cav.	Commelinaceae	Mon.	Per.	5x = 30 ^k	901	30.03	180	60	2.5
653. <i>T. crassifolia</i> Cav.	Commelinaceae	Mon.	Per.	6x = 36 ^k	1068	29.67	178	71	2.5
654. <i>T. crassula</i> Link & Otto	Commelinaceae	Mon.	Per.	12x = 72 ^k	484	6.72	40	32	11.3
655. <i>T. crassula</i> Link & Otto	Commelinaceae	Mon.	Per.	c. 12x = c. 74	582	c. 7.86	c. 48	39	9.6
656. <i>T. edwardsiana</i> Tharp	Commelinaceae	Mon.	Per.	2x = 12 ^k	639	53.26	320	43	1.4
657. <i>T. ernestiana</i> Anders. & Woodson	Commelinaceae	Mon.	Per.	2x = 12 ^k	657	54.79	329	44	1.4
658. <i>T. fluminensis</i> Vell.	Commelinaceae	Mon.	Per.	c. 10x = c. 58 ^k	374	c. 6.45	c. 37	25	11.6
659. <i>T. fluminensis</i> Vell.	Commelinaceae	Mon.	Per.	10x = 60 ^k	470	7.83	47	32	9.7
660. <i>T. fluminensis</i> Vell.	Commelinaceae	Mon.	Per.	11x = 66 ^k	360	5.46	33	24	13.7
661. <i>T. fluminensis</i> Vell.	Commelinaceae	Mon.	Per.	c. 12x = 70 ^k	417	5.96	c. 35	28	12.6
662. <i>T. fluminensis</i> Vell.	Commelinaceae	Mon.	Per.	12x = 72 ^k	474	6.58	39	32	11.5
663. <i>T. gigantea</i> Rose	Commelinaceae	Mon.	Per.	2x = 12 ^k	893	72.42	447	60	1.1
664. <i>T. guatemalensis</i> C. B. Clarke	Commelinaceae	Mon.	Per.	4x? = 52 ^k	1253	24.09	313	84	3.1
665. <i>T. gufengolensis</i> Matuda	Commelinaceae	Mon.	Per.	2x = 12 ^k	520	43.32	260	35	1.7
666. <i>T. hirsuticaulis</i> Small	Commelinaceae	Mon.	Per.	2x = 12 ^k	678	56.51	339	45	1.3
667. <i>T. hirsutiflora</i> Bush	Commelinaceae	Mon.	Per.	2x = 12 ^k	652	54.35	326	44	1.4
668. <i>T. hirsutiflora</i> Bush	Commelinaceae	Mon.	Per.	4x = 24 ^k	1538	64.09	385	103	1.2
669. <i>T. hirsutiflora</i> Bush X	Commelinaceae	Mon.	Per.	2x = 12 ^k	801	66.76	401	53	1.1
<i>T. subacaulis</i> Bush clone 4430									
670. <i>T. humilis</i> Rose	Commelinaceae	Mon.	Per.	2x = 12 ^k	979	81.61	490	65	0.9
671. <i>T. longipes</i> Anders. & Woodson	Commelinaceae	Mon.	Per.	4x = 24 ^k	1703	70.97	426	114	1.1
672. <i>T. micrantha</i> Torr.	Commelinaceae	Mon.	Per.	4x = 24 ^k	661	27.53	165	44	2.8
673. <i>T. navicularis</i> Ortgies	Commelinaceae	Mon.	Per.	4x = 32 ^k	661	20.66	165	44	3.7
674. <i>T. occidentalis</i> (Britt.) Smyth	Commelinaceae	Mon.	Per.	2x = 12 ^k	680	56.69	340	45	1.3
675. <i>T. occidentalis</i> (Britt.) Smyth	Commelinaceae	Mon.	Per.	4x = 24 ^k	1201	50.02	300	80	1.5
676. <i>T. ohioensis</i> Raf.	Commelinaceae	Mon.	Per.	2x = 12 ^k	646	53.86	323	43	1.4
677. <i>T. ohioensis</i> Raf.	Commelinaceae	Mon.	Per.	3x = 18 ^k	1002	55.67	334	67	1.4
678. <i>T. ohioensis</i> Raf.	Commelinaceae	Mon.	Per.	4x = 24 ^k	1215	50.63	304	81	1.5
679. <i>T. ozarkana</i> Anders. & Woodson	Commelinaceae	Mon.	Per.	4x = 24 ^k	1168	48.66	292	78	1.6
680. <i>T. paludosa</i> Anders. & Woodson	Commelinaceae	Mon.	Per.	2x = 12 ^k	711	59.25	356	47	1.3
681. <i>T. paludosa</i> Anders. & Woodson	Commelinaceae	Mon.	Per.	3x = 18 ^k	1005	55.84	335	67	1.4
682. <i>T. paludosa</i> Anders. & Woodson	Commelinaceae	Mon.	Per.	4x = 24 ^k	1464	60.98	366	98	1.2
683. <i>T. paludosa</i> Anders. & Woodson clone B2-2	Commelinaceae	Mon.	Per.	2x = 12 ^k	787	65.59	394	53	1.1

Table 5 (cont.)

Species ^b	Family	Class ^c	Life span ^d	Ploidy and chromosome number (2n) ^e	Nuclear volume ^f (μm ³)	ICVB (μm ³)	Genome volume ^h (μm ³)	Est. 3C DNA ⁱ (pg)	Est. LD ₅₀ ^j (kR)
684. <i>T. pinetorum</i> Greene	Commelinaceae	Mon.	Per.	6x = 36 ^k	1322	36.72	220	88	2.1
685. <i>T. reverchonii</i> Bush	Commelinaceae	Mon.	Per.	4x = 24 ^k	1375	57.29	344	92	1.3
686. <i>T. rosea</i> Vent.	Commelinaceae	Mon.	Per.	4x = 24 ^k	875	36.45	219	59	2.1
687. <i>T. sillamontana</i> Matuda	Commelinaceae	Mon.	Per.	4x = 24 ^k	858	35.74	214	57	2.1
688. <i>T. subacaulis</i> Bush	Commelinaceae	Mon.	Per.	2x = 12 ^k	727	60.56	363	49	1.2
689. <i>T. subaspera</i> Ker-Gawl.	Commelinaceae	Mon.	Per.	4x = 24 ^k	1107	46.14	277	74	1.6
690. <i>T. subtilis</i> Matuda	Commelinaceae	Mon.	Per.	2x = 12 ^k	795	66.22	397	53	1.1
691. <i>T. tepoxtlana</i> Matuda	Commelinaceae	Mon.	Per.	2x = 12 ^k	534	44.53	267	36	1.7
692. <i>T. tolimanensis</i> Matuda	Commelinaceae	Mon.	Per.	4x = 24 ^k	668	27.83	167	45	2.7
693. <i>T. tonalamonticola</i> Matuda	Commelinaceae	Mon.	Per.	2x = 12	231	19.21	115	15	3.9
694. <i>T. virginiana</i> L.	Commelinaceae	Mon.	Per.	4x = 24 ^k	1116	46.53	279	74	1.6
695. <i>T. virginiana</i> L. hybrid	Commelinaceae	Mon.	Per.	c. 3x = 19 ^k	1159	60.99	c. 579	78	1.2
696. <i>T. virginiana</i> L. hybrid	Commelinaceae	Mon.	Per.	c. 4x = 21 ^k	950	45.25	c. 475	64	1.7
697. <i>T. virginiana</i> L. hybrid	Commelinaceae	Mon.	Per.	c. 4x = 23 ^k	1280	55.65	c. 320	86	1.4
698. <i>T. virginiana</i> L. cv. Iris Prichard	Commelinaceae	Mon.	Per.	4x = 24 ^k	1332	55.50	333	89	1.4
699. <i>T. virginiana</i> L. cv. Purple Dome	Commelinaceae	Mon.	Per.	4x = 24 ^k	1381	57.54	345	92	1.3
700. <i>Trichostema dichotomum</i> L.	Labiatae	Dic.	Ann.	2x = 38	140	3.67	70	9	20.4
701. <i>Tridax procumbens</i> L.	Compositae	Dic.	Ann.	2x = 36	491	13.65	246	33	5.5
702. <i>Tridens pulchellus</i> (HBK) Hitchc.	Gramineae	Mon.	Per.	2x = 16 ^k	53	3.33	27	4	22.9
703. <i>Trifolium hirtum</i> All.	Leguminosae	Dic.	Ann.	2x = 10 ^k	98	9.82	49	7	7.7
704. <i>T. pratense</i> L.	Leguminosae	Dic.	Per.	2x = 14	74	5.28	37	5	14.3
705. <i>T. repens</i> L. (S184)	Leguminosae	Dic.	Per.	4x = 32 ^k	94	2.93	23	6	26.1
706. <i>T. repens</i> L. cv. White Dutch	Leguminosae	Dic.	Per.	4x = 32 ^k	110	3.44	28	7	22.2
707. <i>T. repens</i> L. cv. Yugoslavian	Leguminosae	Dic.	Per.	4x = 32 ^k	99	3.11	25	7	24.4
708. <i>Trillium apetalon</i> Makino	Liliaceae	Mon.	Per.	4x = 20 ^k	2242	112.08	560	150	0.7
709. <i>T. cernuum</i> L.	Liliaceae	Mon.	Per.	2x = 10 ^k	1063	106.33	532	71	0.7
710. <i>T. erectum</i> L.	Liliaceae	Mon.	Per.	2x = 10 ^k	1206	120.60	603	81	0.6
711. <i>T. erectum</i> L. var. <i>album</i> Pursh.	Liliaceae	Mon.	Per.	2x = 10	999	99.85	499	67	0.8
712. <i>T. grandiflorum</i> (Michx.) Salisb.	Liliaceae	Mon.	Per.	2x = 10	1553	155.31	777	104	0.5
713. <i>T. haagae</i> Miyabe & Tatewaki	Liliaceae	Mon.	Per.	6x = 30	2843	94.78	474	190	0.8
714. <i>T. kamtschaticum</i> Pall.	Liliaceae	Mon.	Per.	2x = 10	890	89.04	445	60	0.9
715. <i>T. luteum</i> (Muhl.) Harb.	Liliaceae	Mon.	Per.	2x = 10	1936	193.64	968	130	0.4
716. <i>T. sessile</i> L.	Liliaceae	Mon.	Per.	2x = 10	1180	118.04	590	79	0.6
717. <i>T. stylosum</i> Nutt.	Liliaceae	Mon.	Per.	2x = 10	785	78.53	393	53	1.0
718. <i>T. undulatum</i> Willd.	Liliaceae	Mon.	Per.	2x = 10	1489	148.92	745	100	0.5
719. <i>Tripogandra diuretica</i> (Martius) Handlos	Commelinaceae	Mon.	Per.	8x = 64 ^k	501	7.83	63	34	9.7
720. <i>T. elongata</i> (C. F. W. Mey.) Woodson	Commelinaceae	Mon.	Per.	8x = 64 ^k	657	10.27	82	44	7.3
721. <i>T. glandulosa</i> (Seubert) Rohw.	Commelinaceae	Mon.	Per.	2x = 16 ^k	306	19.12	153	21	4.0
722. <i>T. grandiflora</i> (Donn. Sm.) Woodson	Commelinaceae	Mon.	Per.	2x = 16 ^k	343	21.46	172	23	3.5
723. <i>T. montana</i> Handlos (Ined.)	Commelinaceae	Mon.	Per.	c. 5x = 42 ^k	636	15.15	c. 127	43	5.0
724. <i>T. multiflora</i> (Sw.) Raf.	Commelinaceae	Mon.	Per.	8x = 64 ^k	462	7.22	58	31	10.5
725. <i>T. serrulata</i> (Vahl) Handlos	Commelinaceae	Mon.	Per.	4x = 32 ^k	410	12.80	102	27	5.9
726. <i>T. serrulata</i> (Vahl) Handlos	Commelinaceae	Mon.	Per.	6x = 48 ^k	530	11.04	88	35	6.9
727. <i>Triticale</i>	Gramineae	Mon.	Ann.	6x = 42	750	17.86	125	50	4.2
728. <i>Triticale</i>	Gramineae	Mon.	Ann.	8x = 56	806	14.39	101	54	5.2
729. <i>Triticum aegilopoides</i> Thurb. ex A. Gray var. <i>boeoticum</i>	Gramineae	Mon.	Ann.	2x = 14	243	17.35	121	16	4.3

Table 5 (cont.)

Species ^b	Family	Class ^c	Life span ^d	Ploidy and chromosome number (2n) ^e	Nuclear volume ^f (μm^3)	ICVG (μm^3)	Genome volume ^h (μm^3)	Est. 3C DNA ⁱ (pg)	Est. LD50 ^j (kR)
730. <i>T. aestivum</i> L. cv. Indus	Gramineae	Mon.	Ann.	6x = 42	676	16.09	113	45	4.7
731. <i>T. aestivum</i> L. cv. Marfed	Gramineae	Mon.	Ann.	6x = 42	672	16.00	112	45	4.7
732. <i>T. aestivum</i> L. cv. Opal	Gramineae	Mon.	Ann.	6x = 42	629	14.98	105	42	5.0
733. <i>T. aestivum</i> L. cv. Pawnee	Gramineae	Mon.	Ann.	6x = 42	612	14.56	102	41	5.2
734. <i>T. aestivum</i> L. cv. Rescue	Gramineae	Mon.	Ann.	6x = 42	722	17.20	120	48	4.4
735. <i>T. durum</i> Desf. cv. Hordeiforme	Gramineae	Mon.	Ann.	4x = 28	446	15.94	112	30	4.8
736. <i>T. durum</i> Desf. cv. Reichenbachii	Gramineae	Mon.	Ann.	4x = 28	479	17.10	120	32	4.4
737. <i>T. durum</i> Desf. cv. Stewart	Gramineae	Mon.	Ann.	4x = 28	628	22.42	157	42	3.4
738. <i>T. monococcum</i> L.	Gramineae	Mon.	Ann.	2x = 14	244	17.42	122	16	4.3
739. <i>T. monococcum</i> L. var. <i>flavescens</i>	Gramineae	Mon.	Ann.	2x = 14	258	18.41	129	17	4.1
740. <i>Tritonia crocata</i> Ker-Gawl.	Iridaceae	Mon.	Per.	2x = 20	126	6.28	63	8	12.0
741. <i>Tropaeolum majus</i> L.	Tropaeolaceae	Dic.	Ann.	4x = 28	167	5.96	42	11	12.6
742. <i>Tulbaghia violacea</i> Harv.	Liliaceae	Mon.	Per.	2x = 12	844	70.35	422	57	1.1
743. <i>Tulipa</i> sp. cv. Athlete	Liliaceae	Mon.	Per.	2x = 24 ^k	662	27.57	331	44	2.7
744. <i>T.</i> sp. cv. Golden Harvest	Liliaceae	Mon.	Per.	2x = 24 ^k	1435	59.80	718	96	1.3
745. <i>T.</i> sp. cv. Marshall Haig	Liliaceae	Mon.	Per.	2x = 24 ^k	701	29.19	350	47	2.6
746. <i>T. batalini</i> Regel	Liliaceae	Mon.	Per.	2x = 24	512	21.33	256	34	3.6
747. <i>T. fosteriana</i> Hoog. ex B. Fedtsch. cv. Red Emperor	Liliaceae	Mon.	Per.	2x = 24 ^k	1332	55.50	666	89	1.4
748. <i>T. kaufmanniana</i> Regel	Liliaceae	Mon.	Per.	2x = 24	775	32.31	388	52	2.3
749. <i>T. kaufmanniana</i> Regel var. <i>coccinea</i> Hort.	Liliaceae	Mon.	Per.	2x = 24	790	32.92	395	53	2.3
750. <i>Tunica saxifraga</i> Scop.	Caryophyllaceae	Dic.	Per.	4x = 60	119	1.99	30	8	37.8
751. <i>Uvularia grandiflora</i> Sm.	Liliaceae	Mon.	Per.	2x = 14	551	39.37	276	37	1.9
752. <i>U. perfoliata</i> L.	Liliaceae	Mon.	Per.	2x = 14	421	30.06	210	28	2.5
753. <i>Verbascum blattaria</i> L.	Scrophulariaceae	Dic.	Bi.	2x = 30	112	3.72	56	8	20.4
754. <i>Verbena bipinnatifida</i> Nutt.	Verbenaceae	Dic.	Per.	6x = 30	164	5.46	27	11	13.7
755. <i>V. rigida</i> Spreng.	Verbenaceae	Dic.	Per.	6x = 42	182	4.33	30	12	17.6
756. <i>Vicia angustifolia</i> Reichard	Leguminosae	Dic.	Ann.	2x = 12	152	12.66	76	10	6.0
757. <i>V. calcarata</i> Desf.	Leguminosae	Dic.	Ann.	2x = 14	274	19.59	137	18	3.9
758. <i>V. dasycarpa</i> Ten.	Leguminosae	Dic.	Per.	2x = 14	131	9.33	65	9	8.1
759. <i>V. faba</i> L. cv. Sutton's Prolific Longpod	Leguminosae	Dic.	Ann.	2x = 12	598	49.83	299	40	1.5
760. <i>V. grandiflora</i> Scop.	Leguminosae	Dic.	Ann.	2x = 14	193	13.78	96	13	5.5
761. <i>V. hirsuta</i> S. F. Gray	Leguminosae	Dic.	Ann.	2x = 14	141	10.05	70	9	7.5
762. <i>V. lutea</i> L.	Leguminosae	Dic.	?	2x = 14	293	20.90	146	20	3.6
763. <i>V. pannonica</i> Crantz	Leguminosae	Dic.	Ann.	2x = 12	237	19.79	119	16	3.8
764. <i>V. tetrasperma</i> (L.) Schreb.	Leguminosae	Dic.	Ann.	2x = 14	152	10.89	76	10	6.9
765. <i>V. villosa</i> Roth	Leguminosae	Dic.	Per.	2x = 14	164	11.70	82	11	6.5
766. <i>V. villosa</i> Roth var. <i>glabrescens</i>	Leguminosae	Dic.	Per.	2x = 14	162	11.54	81	11	6.6
767. <i>Vigna sinensis</i> (L.) Endl.	Leguminosae	Dic.	Ann.	2x = 22 ^k	143	6.52	72	10	11.6
768. <i>Vinca rosea</i> L.	Apocynaceae	Dic.	Per.	2x = 16	121	7.57	61	8	9.9
769. <i>Yucca filamentosa</i> L.	Amaryllidaceae	Mon.	Per.	2x = 60	356	5.93	178	24	12.8
770. <i>Zea mays</i> L.	Gramineae	Mon.	Ann.	1x = 10 ^k	158	15.83	158	11	4.8
771. <i>Z. mays</i> L. cv. Fancy	Gramineae	Mon.	Ann.	2x = 20	260	13.00	130	17	5.8
772. <i>Z. mays</i> L. cv. Golden Bantam	Gramineae	Mon.	Ann.	2x = 20 ^k	300	14.98	150	20	5.0
773. <i>Z. mays</i> L. hybrid (B14RF X B37RF)	Gramineae	Mon.	Ann.	2x = 20	281	14.05	140	19	5.4
774. <i>Z. mays</i> L. hybrid (WF-9 X 38-11)	Gramineae	Mon.	Ann.	2x = 20	280	14.02	140	19	5.4
775. <i>Zebrina minor</i>	Commelinaceae	Mon.	Per.	4x = 24 ^k	639	26.62	160	43	2.8
776. <i>Z. pendula</i> Schultz.	Commelinaceae	Mon.	Per.	4x = 24 ^k	670	27.93	168	45	2.7
777. <i>Z. pendula</i> Schultz.	Commelinaceae	Mon.	Per.	c. 6x = 33 ^k	1072	32.49	c. 179	72	2.3

Table 5 (cont.)

Species ^b	Family	Class ^c	Life span ^d	Ploidy and chromosome number (2n) ^e	Nuclear volume ^f (μm^3)	ICV ^g (μm^3)	Genome volume ^h (μm^3)	Est. 3C DNA ⁱ (pg)	Est. LD ₅₀ ^j (kR)
778. <i>Z. pendula</i> Schnizl. X <i>Z.</i> sp.	Commelinaceae	Mon.	Per.	c. 4x = 22 ^k	866	39.38	c. 217	58	1.9
779. <i>Z. purpusii</i> Bruckner	Commelinaceae	Mon.	Per.	4x = 24 ^k	604	25.17	151	40	3.0
780. <i>Zephyranthes</i> sp.	Amaryllidaceae	Mon.	Per.	2x = 12 ^k	875	72.89	437	59	1.0

^aA few species listed here are actually fibrous (e.g. *Agave*) or subshrubby (e.g. *Diosphyllum*, some *Hibiscus* spp.), rather than truly herbaceous.

^bSubspecies, vars., cultivars, and different ploidy levels are all considered separately. Unidentified species within a genus are generally omitted, except when part of a polyploid series or when an unknown is the only representative of its genus.

^cMonocot or dicot.

^dAnnual, biennial or perennial. Some plants which are cultivated as annuals are actually perennials (e.g. *Lycopersicon esculentum*).

^eSome genera have more than one base number (e.g. *Allium*) and in some genera the base number has not been ascertained.

^fThese values may differ from previously-published figures. In most such cases, the values given here are averages of several determinations. All volumes determined in A. H. Sparrow laboratory.

^gICVs were calculated before nuclear volumes were rounded off to whole numbers. Thus ICVs derived from the same apparent nuclear volume may not agree precisely.

^hThe volume of a single basic chromosome complement, estimated by dividing nuclear volume by ploidy level. Differences in genome volume, or in DNA per genome, have been shown to have possible evolutionary significance (Sparrow and Nauman 1973, 1976).

ⁱEstimated from nuclear volume using the correlation demonstrated by Baetcke *et al.* (1967). See discussion in text and Figs. 1, 4.

^jEstimated from ICV as described by Sparrow & Schwemmer (1974).

^kChromosome count determined or confirmed in A. H. Sparrow laboratory. All others from the literature.

Table 6

Family, class, ploidy, chromosome number, nuclear volume, interphase chromosome volume (ICV), genome
volume, estimated 3C DNA content and estimated LD₅₀ of 362 species of woody plants

Species ^a	Family	Class ^b	Ploidy and chromosome number(2n)	Nuclear volume ^c (μm^3)	ICV ^d (μm^3)	Genome volume ^e (μm^3)	Est. 3C DNA ^f (pg)	Est. LD ₅₀ ^g (kR)
1. <i>Abies balsamea</i> (L.) Mill.	Pinaceae	Gym.	2x = 24 ^h	970	40.4	485	65	0.8
2. <i>A. cephalonica</i> Loud.	Pinaceae	Gym.	2x = 24	1149	47.9	575	77	0.7
3. <i>A. concolor</i> (Gord.) Hildebr.	Pinaceae	Gym.	2x = 24	839	35.0	420	56	0.9
4. <i>A. firma</i> Sieb. & Zucc.	Pinaceae	Gym.	2x = 24 ^h	861	35.9	431	57	0.8
5. <i>A. grandis</i> Lindl.	Pinaceae	Gym.	2x = 24	1197	49.9	599	80	0.7
6. <i>A. homolepis</i> Sieb. & Zucc.	Pinaceae	Gym.	2x = 24 ^h	1144	47.7	572	76	0.7
7. <i>A. lasiocarpa</i> (Hook.) Nutt.	Pinaceae	Gym.	2x = 24 ^h	803	33.5	402	54	0.9
8. <i>A. nordmanniana</i> (Stev.) Spach	Pinaceae	Gym.	2x = 24	1479	61.6	740	99	0.6
9. <i>A. pinsapo</i> Boiss.	Pinaceae	Gym.	2x = 24 ^h	1235	51.5	618	82	0.6
10. <i>A. procera</i> Rehd.	Pinaceae	Gym.	2x = 24	1025	42.7	512	68	0.7
11. <i>A. procera</i> Rehd. cv. <i>Glaucia</i>	Pinaceae	Gym.	2x = 24	1041	43.4	521	69	0.7
12. <i>A. sachalinensis</i> Mast.	Pinaceae	Gym.	2x = 24 ^h	1155	48.1	577	77	0.7
13. <i>A. veitchii</i> Lindl.	Pinaceae	Gym.	2x = 24	1011	42.1	506	67	0.7
14. <i>Acer rubrum</i> L.	Aceraceae	Ang.	7x = 91	430	4.7	61	29	3.8
15. <i>A. saccharum</i> Marsh.	Aceraceae	Ang.	2x = 26	125	4.8	62	8	3.7
16. <i>Acmopyle pancheri</i> (Brongn. & Gris.) Pilger	Podocarpaceae	Gym.	2x = 20	353	17.6	176	24	1.4
17. <i>Actinostrobus acuminatus</i> Parl.	Cupressaceae	Gym.	2x = 22 ^h	470	21.4	235	31	1.2
18. <i>A. pyramidalis</i> Miq.	Cupressaceae	Gym.	2x = 22	613	27.9	307	41	1.0
19. <i>Aesculus octandra</i> Marsh.	Hippocastanaceae	Ang.	2x = 40	81	2.0	41	5	7.1
20. <i>Agathis australis</i> (D. Don) Salisb.	Araucariaceae	Gym.	2x = 26	426	15.4	213	28	1.5
21. <i>A. obtusa</i> (Lindl.) Morrison	Araucariaceae	Gym.	2x = 26	537	20.7	268	36	1.3
22. <i>A. palmerstoni</i> F. Muell.	Araucariaceae	Gym.	2x = 26 ^h	429	16.5	215	29	1.5
23. <i>A. robusta</i> (C. Moore) F. M. Bail.	Araucariaceae	Gym.	2x = 26	223	8.6	111	15	2.4
24. <i>Araucaria angustifolia</i> (Bertol.) O. Kuntze	Araucariaceae	Gym.	2x = 26	428	16.5	214	29	1.5
25. <i>A. araucana</i> (Mol.) K. Koch	Araucariaceae	Gym.	2x = 26	772	29.7	386	52	1.0
26. <i>A. bidwillii</i> Hook.	Araucariaceae	Gym.	2x = 26	428	16.5	214	29	1.5
27. <i>A. columnaris</i> (Forst.) Hook.	Araucariaceae	Gym.	2x = 26 ^h	401	15.4	200	27	1.6
28. <i>A. cunninghamii</i> D. Don	Araucariaceae	Gym.	2x = 26	496	19.1	248	33	1.3
29. <i>A. heterophylla</i> (Salisb.) Franco	Araucariaceae	Gym.	2x = 26	434	16.7	217	29	1.5
30. <i>A. heterophylla</i> (Salisb.) Franco cv. <i>Glaucia</i>	Araucariaceae	Gym.	2x = 26	353	13.6	177	24	1.7
31. <i>A. klinkii</i> Lauterb.	Araucariaceae	Gym.	2x = 26	378	14.5	189	25	1.6
32. <i>A. rulei</i> F. Muell.	Araucariaceae	Gym.	2x = 26	471	18.1	235	31	1.4
33. <i>Arbutus menziesii</i> Pursh.	Ericaceae	Ang.	2x = 26	97	3.8	49	7	4.4
34. <i>Arctostaphylos uva-ursi</i> Spreng.	Ericaceae	Ang.	4x = 52	276	5.3	69	18	3.5
35. <i>Artemisia arbuscula</i> Nutt. ssp. <i>nova</i> (A. Nels.) Ward	Compositae	Ang.	4x = 36	459	12.8	115	31	1.8
36. <i>A. tridentata</i> Nutt.	Compositae	Ang.	4x = 36	429	11.9	107	29	1.9
37. <i>Athrotaxis selaginoides</i> Don	Taxodiaceae	Gym.	2x = 22	391	17.8	196	26	1.4

Table 6 (cont.)

Species ^a	Family	Class ^b	Ploidy and chromosome number (2n)	Nuclear volume ^c (μm^3)	1Cvd (μm^3)	Genome volume ^e (μm^3)	Est. 3C DNA ^f (pg)	Est. LD ₅₀ ^g (kR)
38. <i>Austrocedrus chilensis</i> (D. Don) Florin & Boucelje	Cupressaceae	Gym.	2x = 22	648	29.5	324	43	1.0
39. <i>Berberis vulgaris</i> L.	Berberidaceae	Ang.	2x = 28	175	6.2	88	12	3.1
40. <i>Betula lutea</i> Michx. f.	Betulaceae	Ang.	6x = 84	248	3.0	41	17	5.3
41. <i>Buddleia alternifolia</i> Maxim.	Loganiaceae	Ang.	2x = 38	82	2.2	41	6	6.6
42. <i>B. colvilei</i> Hook.	Loganiaceae	Ang.	c. 16x = 300	901	3.0	c. 56	60	5.3
43. <i>B. davidii</i> Franch.	Loganiaceae	Ang.	4x = 76	146	1.9	37	10	7.4
44. <i>Callitris canescens</i> (Parl.) S. T. Blake	Cupressaceae	Gym.	2x = 22	388	17.7	194	26	1.4
45. <i>C. endlicheri</i> (Parl.) F. M. Bail.	Cupressaceae	Gym.	2x = 22	272	12.4	136	18	1.8
46. <i>C. muelleri</i> (Parl.) F. Muell.	Cupressaceae	Gym.	2x = 22	504	22.9	252	34	1.2
47. <i>C. oblonga</i> Rich.	Cupressaceae	Gym.	2x = 22	548	24.9	274	37	1.1
48. <i>C. preissii</i> Miq.	Cupressaceae	Gym.	2x = 22	231	10.5	116	15	2.1
49. <i>C. rhomboidea</i> R. Br. ex L. C. Rich	Cupressaceae	Gym.	2x = 22	260	11.8	130	17	1.9
50. <i>Calocedrus decurrens</i> (Torr.) Florin	Cupressaceae	Gym.	2x = 22 ^h	372	16.9	186	25	1.5
51. <i>C. macrolepis</i> Kurz	Cupressaceae	Gym.	2x = 22	427	19.4	214	29	1.3
52. <i>Calotropis gigantea</i> R. Br.	Asclepiadaceae	Ang.	2x = 22	102	4.6	51	7	3.8
53. <i>Calycanthus floridus</i> L.	Calycanthaceae	Ang.	2x = 22	222	10.1	111	15	2.2
54. <i>Camellia japonica</i> L. cv. Zoraida Wanzl	Theaceae	Ang.	2x = 30 ^h	345	11.5	172	23	1.9
55. <i>Caragana arborescens</i> Lam.	Leguminosae	Ang.	4x = 32	305	9.5	76	20	2.2
56. <i>Carya cordiformis</i> (Wang.) K. Koch	Juglandaceae	Ang.	2x = 32	56	1.8	28	4	7.7
57. <i>C. illinoensis</i> (Wang.) K. Koch cv. Sioux	Juglandaceae	Ang.	2x = 32	196	6.1	98	13	3.1
58. <i>C. laciniata</i> (Michx. f.) Loud.	Juglandaceae	Ang.	2x = 32	123	3.8	62	8	4.4
59. <i>C. ovata</i> (Mill.) K. Koch	Juglandaceae	Ang.	2x = 32	80	2.5	40	5	6.0
60. <i>C. tomentosa</i> (Poir.) Nutt.	Juglandaceae	Ang.	4x = 64	112	1.8	28	8	7.7
61. <i>Castanea dentata</i> (Marsh.) Borkh.	Fagaceae	Ang.	2x = 24	113	4.7	56	8	3.8
62. <i>Cedrus atlantica</i> (Endl.) Carr. cv. Glauca	Pinaceae	Gym.	2x = 24 ^h	1008	42.0	504	67	0.7
63. <i>C. brevifolia</i> (Hook. f.) Henry	Pinaceae	Gym.	2x = 24	941	39.2	471	63	0.8
64. <i>C. deodara</i> (Roxb.) G. Don	Pinaceae	Gym.	2x = 24	1100	45.8	550	73	0.7
65. <i>C. libani</i> A. Rich.	Pinaceae	Gym.	2x = 24	801	33.4	400	53	0.9
66. <i>Cephalanthus occidentalis</i> L.	Rubiaceae	Ang.	4x = 44	107	2.4	27	7	6.2
67. <i>Cephalotaxus fortunei</i> Hook.	Cephalotaxaceae	Gym.	2x = 24	863	36.0	431	58	0.8
68. <i>C. harringtonia</i> (Forbes) K. Koch var. <i>drupacea</i> (Sieb. & Zucc.) Koidz.	Cephalotaxaceae	Gym.	2x = 24	639	26.6	319	43	1.0
69. <i>C. harringtonia</i> (Forbes) K. Koch cv. <i>Prostrata</i>	Cephalotaxaceae	Gym.	2x = 24 ^h	811	33.8	405	54	0.9
70. <i>Ceratozamia recurvata</i>	Zamiaceae	Gym.	2x = 16 ^h	1800	112.5	900	120	0.4
71. <i>Chamaecyparis formosensis</i> Matsum.	Cupressaceae	Gym.	2x = 22	387	17.6	194	26	1.4
72. <i>C. lawsoniana</i> (A. Murr.) Parl. cv. <i>Columnaris</i>	Cupressaceae	Gym.	2x = 22	378	17.2	189	25	1.4
73. <i>C. lawsoniana</i> (A. Murr.) Parl. cv. <i>Wisselii</i>	Cupressaceae	Gym.	2x = 22	378	17.2	189	25	1.4

Table 6 (cont.)

Species ^a	Family	Class ^b	Ploidy and chromosome number(2n)	Nuclear volume ^c (μm^3)	ICV ^d (μm^3)	Genome volume ^e (μm^3)	Est. 3C DNA ^f (pg)	Est. LD50 ^g (kR)
74. <i>C. nootkatensis</i> (D. Don) Spach	Cupressaceae	Gym.	2x = 22	448	20.4	224	30	1.3
75. <i>C. obtusa</i> (Sieb. & Zucc.) Endl. cv. Compacta	Cupressaceae	Gym.	2x = 22	231	10.5	116	15	2.1
76. <i>C. obtusa</i> (Sieb. & Zucc.) Endl. cv. Gracilis Nana	Cupressaceae	Gym.	2x = 22 ^h	355	16.1	177	24	1.5
77. <i>C. pisifera</i> (Sieb. & Zucc.) Endl.	Cupressaceae	Gym.	2x = 22	330	15.0	165	22	1.6
78. <i>C. thuyoides</i> (L.) Britt., Sterns & Pogg. cv. Glauca	Cupressaceae	Gym.	2x = 22	493	22.4	246	33	1.2
79. <i>Chrysothamnus nauseosus</i> (Pall.) Britt.	Compositae	Ang.	2x = 18	181	10.1	91	12	2.2
80. <i>Citrus aurantium</i> L.	Rutaceae	Ang.	2x = 18	73	4.1	37	5	4.2
81. <i>C. limonia</i> Burm. f. cv. Villa Franca	Rutaceae	Ang.	2x = 18 ^h	73	4.1	37	5	4.2
82. <i>C. paradisi</i> Macf. cv. Duncan	Rutaceae	Ang.	2x = 18 ^h	102	5.7	51	7	3.3
83. <i>C. reticulata</i> Blanco cv. Cleopatra	Rutaceae	Ang.	2x = 18	59	3.3	30	4	4.9
84. <i>C. sinensis</i> Osbeck cv. Parson Brown	Rutaceae	Ang.	2x = 18 ^h	74	4.1	37	5	4.2
85. <i>Clematis jackmanii</i> Moore	Ranunculaceae	Ang.	2x = 16	293	18.3	147	20	1.4
86. <i>C. virginiana</i> L.	Ranunculaceae	Ang.	2x = 16	255	16.0	128	17	1.5
87. <i>Clethra alnifolia</i> L.	Clethraceae	Ang.	4x = 32	135	4.2	34	9	4.1
88. <i>Coffea arabica</i> L.	Rubiaceae	Ang.	4x = 44	172	3.9	43	12	4.3
89. <i>Cornus florida</i> L.	Cornaceae	Ang.	2x = 22 ^h	151	6.9	75	10	2.8
90. <i>Cowania mexicana</i> D. Don var. stansburiana (Torr.) Jeps.	Rosaceae	Ang.	2x = 18	93	5.2	47	6	3.5
91. <i>Crotalaria mucronata</i> Desv.	Leguminosae	Ang.	2x = 16	168	10.5	84	11	2.1
92. <i>Croton bonplandianum</i> Baill.	Euphorbiaceae	Ang.	2x = 20 ^h	117	5.8	58	8	3.2
93. <i>Cryptomeria japonica</i> (L. f.) Don cv. Araucarioides	Taxodiaceae	Gym.	2x = 22 ^h	470	15.7	235	31	1.5
94. <i>C. japonica</i> (L. f.) Don cv. Elegans Nana	Taxodiaceae	Gym.	2x = 22 ^h	479	21.8	239	32	1.2
95. <i>C. japonica</i> (L. f.) Don cv. Glauca	Taxodiaceae	Gym.	2x = 22	430	19.6	215	29	1.3
96. <i>Cunninghamia lanceolata</i> (Lamb.) Hook. f.	Taxodiaceae	Gym.	2x = 22	470	21.4	235	31	1.2
97. <i>Cupressocyparis leylandii</i> (Jacks. & Dallim.) Dallim. cv. Naylor's Blue	Cupressaceae	Gym.	2x = 22	702	31.9	351	47	0.9
98. <i>Cupressus abramsiana</i> C. B. Wolf	Cupressaceae	Gym.	2x = 22	408	18.6	204	27	1.3
99. <i>C. arizonica</i> Greene cv. Conica	Cupressaceae	Gym.	2x = 22	386	17.6	193	26	1.4
100. <i>C. cashmeriana</i> Royle ex Carr.	Cupressaceae	Gym.	2x = 22	352	16.0	176	24	1.5
101. <i>C. duclouxiana</i> Hickel	Cupressaceae	Gym.	2x = 22	315	14.3	157	21	1.7
102. <i>C. dupreziana</i> Camus	Cupressaceae	Gym.	2x = 22	335	15.2	168	22	1.6
103. <i>C. funebris</i> Endl.	Cupressaceae	Gym.	2x = 22	414	18.8	207	28	1.3
104. <i>C. goveniana</i> Cord.	Cupressaceae	Gym.	2x = 22	609	27.7	305	41	1.0
105. <i>C. lusitanica</i> Mill.	Cupressaceae	Gym.	2x = 22	355	16.2	178	24	1.5
106. <i>C. macnabiana</i> Murray	Cupressaceae	Gym.	2x = 22	461	20.9	230	31	1.2
107. <i>C. macrocarpa</i> Hartw. cv. Donard Gold	Cupressaceae	Gym.	2x = 22	455	20.7	228	30	1.3
108. <i>C. pygmaea</i> (Lemm.) Sarg.	Cupressaceae	Gym.	2x = 22	508	23.1	254	34	1.2
109. <i>C. sargentii</i> Jepson	Cupressaceae	Gym.	2x = 22	483	22.0	242	32	1.2

Table 6 (cont.)

Species ^a	Family	Class ^b	Ploidy and chromosome number (2n)	Nuclear volume ^c (μm^3)	ICV ^d (μm^3)	Genome volume ^e (μm^3)	Est. 3C DNA ^f (pg)	Est. LD ₅₀ ^g (kR)
110. <i>C. sempervirens</i> L.	Cupressaceae	Gym.	2x = 22	280	12.7	140	19	1.8
111. <i>C. torulosa</i> Don	Cupressaceae	Gym.	2x = 22	320	14.6	160	21	1.6
112. <i>Cycas circinalis</i> L.	Cycadaceae	Gym.	2x = 16	1522	95.2	761	102	0.4
113. <i>C. revoluta</i> Thunb.	Cycadaceae	Gym.	2x = 22 ^h	1626	73.9	813	108	0.5
114. <i>Dacrydium biddwillii</i> Hook. f.	Podocarpaceae	Gym.	2x = 18	346	19.2	173	23	1.3
115. <i>D. cupressinum</i> Soland.	Podocarpaceae	Gym.	2x = 20	281	14.0	140	19	1.7
116. <i>D. franklinii</i> Hook. f.	Podocarpaceae	Gym.	2x = 30	237	7.9	118	16	2.6
117. <i>Dioon spinulosum</i> Dyer	Zamiaceae	Gym.	2x = 18	1433	79.6	716	96	0.5
118. <i>Diselma archeri</i> Hook. f.	Cupressaceae	Gym.	2x = 22	456	20.7	228	30	1.3
119. <i>Encephalartos lebomboensis</i> Verdoorn	Zamiaceae	Gym.	2x = 18	2047	113.7	1023	137	0.4
120. <i>E. umbeluziensis</i> R. A. Dyer	Zamiaceae	Gym.	2x = 18	1506	83.7	753	100	0.4
121. <i>Ephedra americana</i> Humb. & Bonpl. var. <i>andina</i> Stapf.	Ephedraceae	Gym.	4x = 28 ^h	878	31.4	220	59	0.9
122. <i>E. distachya</i> L.	Ephedraceae	Gym.	2x = 14	845	60.3	422	56	0.6
123. <i>E. equisetina</i> Bunge	Ephedraceae	Gym.	2x = 14	264	18.8	132	18	1.3
124. <i>E. foliata</i> Boiss. ex Mey.	Ephedraceae	Gym.	2x = 14	157	22.4	157	11	1.2
125. <i>E. fragilis</i> Desf.	Ephedraceae	Gym.	2x = 14	190	13.6	95	13	1.7
126. <i>E. fragilis</i> Desf. var. <i>campylopoda</i> (C. A. Mey.) Stapf	Ephedraceae	Gym.	2x = 14	422	30.1	211	28	1.0
127. <i>E. major</i> Host	Ephedraceae	Gym.	2x = 14	249	17.8	125	17	1.4
128. <i>E. nevadensis</i> Wats.	Ephedraceae	Gym.	2x = 14	623	44.5	311	42	0.7
129. <i>E. tweediana</i> C. A. Mey.	Ephedraceae	Gym.	2x = 14	504	36.0	252	34	0.8
130. <i>E. viridis</i> Cov.	Ephedraceae	Gym.	2x = 14	631	45.1	316	42	0.7
131. <i>Eucalyptus obliqua</i> L'Her.	Myrtaceae	Ang.	2x = 22	132	6.0	66	9	3.1
132. <i>Euonymus japonicus</i> L.	Celastraceae	Ang.	4x = 32	101	3.2	25	7	5.0
133. <i>Euphorbia pulcherrima</i> Willd. ex Klotzsch	Euphorbiaceae	Ang.	4x = 28	482	17.2	121	32	1.4
134. <i>Fagus grandifolia</i> Ehrh.	Fagaceae	Ang.	2x = 24	56	2.3	28	4	6.4
135. <i>Ficus carica</i> L. cv. <i>Celeste</i>	Moraceae	Ang.	2x = 26	61	2.4	31	4	6.2
136. <i>Fitzroya cupressoides</i> (Mol.) Johnston	Cupressaceae	Gym.	4x = 44	607	13.8	152	41	1.7
137. <i>Fokienia hodginsii</i> Henry & Thomas	Cupressaceae	Gym.	2x = 22	317	14.4	159	21	1.6
138. <i>Forsythia X intermedia</i> Zab. cv. <i>Arnold Dwarf</i>	Oleaceae	Ang.	2x = 28	102	3.7	51	7	4.5
139. <i>Franseria dumosa</i> Gray	Compositae	Ang.	4x = 36 ^h	152	4.2	38	10	4.1
140. <i>Fraxinus americana</i> L.	Oleaceae	Ang.	2x = 46	218	4.7	109	15	3.8
141. <i>Gardenia jasminoides</i> Ellis	Rubiaceae	Ang.	2x = 22	110	5.0	55	7	3.6
142. <i>Gaylussacia baccata</i> (Wang.) K. Koch	Ericaceae	Ang.	2x = 24	33	1.4	16	2	9.3
143. <i>Ginkgo biloba</i> L.	Ginkgoaceae	Gym.	2x = 24 ^h	810	33.8	405	54	0.9
144. <i>Glyptostrobus lineatus</i> (Poir.) Druce	Taxodiaceae	Gym.	3x = 33 ^h	417	12.6	139	28	1.8
145. <i>Gnetum gnemon</i> L.	Gnetaceae	Gym.	2x = 44 ^h	244	5.6	122	16	3.3
146. <i>G. indicum</i> Merrill	Gnetaceae	Gym.	2x = 44	457	10.4	228	31	2.1
147. <i>G. scandens</i> Roxb.	Gnetaceae	Gym.	2x = 44	241	5.5	241	16	3.4
148. <i>Grayia spinosa</i> (Hook.) Moq.	Chenopodiaceae	Ang.	?x = 36 ^h	128	3.6	—	9	4.6
149. <i>Hevea brasiliensis</i> Muell. Arg.	Euphorbiaceae	Ang.	4x = 36	138	3.8	35	9	4.4
150. <i>Ilex glabra</i> (L.) Gray	Aquifoliaceae	Ang.	4x = 40 ^h	138	3.5	35	9	4.7
151. <i>I. verticillata</i> (L.) Gray	Aquifoliaceae	Ang.	4x = 36	317	8.8	79	21	2.4
152. <i>Juglans nigra</i> L.	Juglandaceae	Ang.	2x = 32	146	4.6	73	8	3.8

Table 6 (cont.)

Species ^a	Family	Class ^b	Ploidy and chromosome number(2n)	Nuclear volume ^c (μm^3)	ICV ^d (μm^3)	Genome volume ^e (μm^3)	Est. 3C DNA ^f (pg)	Est. LD ₅₀ ^g (kR)
153. <i>J. regia</i> L.	Juglandaceae	Ang.	2x = 32	110	3.4	55	7	4.8
154. <i>Juniperus bermudiana</i> L.	Cupressaceae	Gym.	2x = 22	335	15.2	168	22	1.6
155. <i>J. chinensis</i> L.	Cupressaceae	Gym.	4x = 44 ^h	996	22.6	249	66	1.2
156. <i>J. chinensis</i> L. cv. Pfitzeriana Compacta	Cupressaceae	Gym.	4x = 44 ^h	780	17.7	195	52	1.4
157. <i>J. chinensis</i> L. cv. Procumbens	Cupressaceae	Gym.	4x = 44 ^h	677	15.4	169	45	1.6
158. <i>J. chinensis</i> L. cv. Sargentii	Cupressaceae	Gym.	4x = 44 ^h	630	14.3	157	42	1.7
159. <i>J. chinensis</i> L. cv. Torulosa	Cupressaceae	Gym.	2x = 22	415	18.9	207	28	1.3
160. <i>J. communis</i> L.	Cupressaceae	Gym.	2x = 22	341	15.5	171	23	1.6
161. <i>J. communis</i> L. var. depressa Pursh	Cupressaceae	Gym.	2x = 22	413	18.8	206	28	1.4
162. <i>J. drupacea</i> Labill.	Cupressaceae	Gym.	2x = 22	410	18.6	205	27	1.4
163. <i>J. excelsa</i> Steb.	Cupressaceae	Gym.	2x = 22	381	17.3	191	25	1.4
164. <i>J. horizontalis</i> Moench cv. Bar Harbor	Cupressaceae	Gym.	2x = 22 ^h	406	18.5	203	27	1.4
165. <i>J. osteosperma</i> (Torr.) Little	Cupressaceae	Gym.	2x = 22 ^h	517	23.5	259	35	1.1
166. <i>J. procera</i> Hochst.	Cupressaceae	Gym.	4x = 44 ^h	787	17.9	197	53	1.4
167. <i>J. rigida</i> Steb. & Zucc.	Cupressaceae	Gym.	2x = 22	562	25.5	281	38	1.1
168. <i>J. sabina</i> L.	Cupressaceae	Gym.	2x = 22 ^h	505	23.0	253	34	1.2
169. <i>J. scopulorum</i> Sarg.	Cupressaceae	Gym.	4x = 44	1088	24.7	272	73	1.1
170. <i>J. squamata</i> Buch.-Ham. cv. Prostrata	Cupressaceae	Gym.	4x = 44 ^h	932	21.2	233	62	1.2
171. <i>J. squamata</i> Buch.-Ham. cv. Wilsonii	Cupressaceae	Gym.	4x = 44	812	18.5	203	54	1.4
172. <i>J. virginiana</i> L.	Cupressaceae	Gym.	2x = 22	413	18.8	207	28	1.4
173. <i>Kalmia angustifolia</i> L.	Ericaceae	Ang.	4x = 48	127	2.6	32	9	5.9
174. <i>K. latifolia</i> L.	Ericaceae	Ang.	2x = 24	167	7.0	84	11	2.8
175. <i>Keteleeria davidiana</i> (Bertr.) Beissn.	Pinaceae	Gym.	2x = 24	1090	45.4	545	73	0.7
176. <i>Kolkwitzia amabilis</i> Graebn.	Caprifoliaceae	Ang.	4x = 32	89	2.8	22	6	5.5
177. <i>Larix dahurica</i> Turcz. ex Trautv.	Pinaceae	Gym.	2x = 24	745	31.0	373	50	0.9
178. <i>L. decidua</i> Mill.	Pinaceae	Gym.	2x = 24	902	37.6	451	60	0.8
179. <i>L. X eurolepis</i> A. Henry	Pinaceae	Gym.	2x = 24	1040	43.3	520	69	0.7
180. <i>L. laricina</i> (DuRoi) K. Koch	Pinaceae	Gym.	2x = 24	1110	46.3	555	74	0.7
181. <i>L. leptolepis</i> (Steb. & Zucc.) Endl.	Pinaceae	Gym.	2x = 24 ^h	1165	48.5	582	78	0.7
182. <i>L. occidentalis</i> Nutt.	Pinaceae	Gym.	2x = 24	790	32.9	395	53	0.9
183. <i>Larrea divaricata</i> Cav.	Zygophyllaceae	Ang.	2x = 26	212	8.1	106	14	2.5
184. <i>Libocedrus bidwillii</i> Hook. f.	Cupressaceae	Gym.	2x = 22	487	22.1	243	33	1.2
185. <i>L. plumosa</i> (D. Don) Sarg.	Cupressaceae	Gym.	2x = 22	451	20.5	226	30	1.3
186. <i>Liriodendron tulipifera</i> L.	Magnoliaceae	Ang.	2x = 38	242	6.4	121	16	3.0
187. <i>Lonicera X heckrottii</i> Rehd.	Caprifoliaceae	Ang.	4x = 36	315	8.8	79	21	2.4
188. <i>L. japonica</i> Thunb. var. <i>chinensis</i> (P. W. Wats.) Baker	Caprifoliaceae	Ang.	2x = 18	153	8.5	77	10	2.4
189. <i>L. japonica</i> Thunb. cv. Halliana	Caprifoliaceae	Ang.	2x = 18	62	3.4	31	4	4.8
190. <i>Lycium andersonii</i> Gray	Solanaceae	Ang.	4x = 48	466	9.7	116	31	2.2
191. <i>Lyonia mariana</i> (L.) D. Don	Ericaceae	Ang.	2x = 24	56	2.3	28	4	6.4
192. <i>Magnolia acuminata</i> L.	Magnoliaceae	Ang.	4x = 76	552	7.3	138	37	2.7
193. <i>M. fraseri</i> Walt.	Magnoliaceae	Ang.	2x = 38	244	6.4	122	16	3.0
194. <i>M. grandiflora</i> L.	Magnoliaceae	Ang.	6x = 114	702	6.2	117	47	3.1
195. <i>M. macrophylla</i> Michx.	Magnoliaceae	Ang.	2x = 38	309	8.1	155	21	2.5
196. <i>M. X soulangeana</i> Hort. ex Thieb.	Magnoliaceae	Ang.	5x = 95	477	5.0	95	32	3.6

Table 6 (cont.)

Species ^a	Family	Class ^b	Ploidy and chromosome number(2n)	Nuclear volume ^c (μm^3)	ICV ^d (μm^3)	Genome volume ^e (μm^3)	Est. 3C DNA ^f (pg)	Est. LD ₅₀ ^g (kR)
197. <i>Mahonia aquifolium</i> Nutt.	Berberidaceae	Ang.	2x = 28	98	3.5	49	7	4.7
198. <i>Manihot dulcis</i> Pax cv. Valencia	Euphorbiaceae	Ang.	4x = 36	188	5.2	47	13	3.5
199. <i>Metasequoia glyptostroboides</i> Hu & Cheng	Taxodiaceae	Gym.	2x = 22	461	21.0	230	31	1.2
200. <i>Microcachrys tetragona</i> Hook. f.	Podocarpaceae	Gym.	2x = 30	138	4.6	69	9	3.8
201. <i>Morus nigra</i> L. (?)	Moraceae	Ang.	2x = 28	87	3.1	43	6	5.1
202. <i>Myrica asplenifolia</i> L.	Myricaceae	Ang.	4x = 32	55	1.7	14	4	8.0
203. <i>M. pensylvanica</i> Loisel.	Myricaceae	Ang.	2x = 16	79	5.0	40	5	3.6
204. <i>Oxalis dispar</i> N. E. Br. ex Hook. f.	Oxalidaceae	Ang.	2x = 12	689	57.4	345	46	0.6
205. <i>Paeonia suffruticosa</i> Haw.	Ranunculaceae	Ang.	2x = 10	573	57.3	287	38	0.6
206. <i>Papuacedrus papuana</i> (F. Muell.) Li	Cupressaceae	Gym.	2x = 22	419	19.1	210	28	1.3
207. <i>Parthenocissus quinquefolia</i> (L.) Planch.	Vitaceae	Ang.	2x = 40	64	1.6	32	4	8.4
208. <i>Persea americana</i> Mill.	Lauraceae	Ang.	2x = 24	169	7.0	85	11	2.8
209. <i>Phoradendron flavescens</i> Nutt.	Loranthaceae	Ang.	2x = 28	884	31.6	442	59	0.9
210. <i>Phyllocladus trichomanoides</i> D. Don	Podocarpaceae	Gym.	2x = 18	436	24.2	218	29	1.1
211. <i>Picea abies</i> (L.) Karst.	Pinaceae	Gym.	2x = 24 ^h	1023	42.6	512	68	0.7
212. <i>P. asperata</i> Mast.	Pinaceae	Gym.	2x = 24	814	33.9	407	54	0.9
213. <i>P. bicolor</i> (Maxim.) Mayr	Pinaceae	Gym.	2x = 24	887	36.9	443	59	0.8
214. <i>P. breweriana</i> S. Wats.	Pinaceae	Gym.	2x = 24 ^h	1578	65.7	789	105	0.5
215. <i>P. engelmanni</i> (Parry) Engelm.	Pinaceae	Gym.	2x = 24	964	40.2	482	64	0.7
216. <i>P. glauca</i> (Moench) Voss	Pinaceae	Gym.	2x = 24	1088	45.3	544	73	0.7
217. <i>P. glehnii</i> (Fr. Schmidt) Mast.	Pinaceae	Gym.	2x = 24	1059	44.2	530	71	0.7
218. <i>P. jezoensis</i> (Sieb. & Zucc.) Carr.	Pinaceae	Gym.	2x = 24	1313	54.7	656	88	0.6
219. <i>P. jezoensis</i> (Sieb. & Zucc.) Carr. var. <i>hondoensis</i> (Mayr) Rehd.	Pinaceae	Gym.	2x = 24 ^h	731	30.5	366	49	0.9
220. <i>P. koyamai</i> Shiras.	Pinaceae	Gym.	2x = 24	898	37.4	449	60	0.8
221. <i>P. mariana</i> (Mill.) Britt., Sterns & Pogg.	Pinaceae	Gym.	2x = 24	795	33.1	397	53	0.9
222. <i>P. maximowiczii</i> (Regel) Mast.	Pinaceae	Gym.	2x = 24	1244	51.8	622	83	0.6
223. <i>P. obovata</i> Ledeb.	Pinaceae	Gym.	2x = 24	773	32.2	387	52	0.9
224. <i>P. omorika</i> (Panc.) Purkyne	Pinaceae	Gym.	2x = 24	817	34.0	408	55	0.9
225. <i>P. orientalis</i> (L.) Link	Pinaceae	Gym.	2x = 24	946	39.4	473	63	0.8
226. <i>P. pungens</i> Engelm.	Pinaceae	Gym.	2x = 24	977	40.7	489	65	0.8
227. <i>P. pungens</i> Engelm. cv. <i>Glaucia</i>	Pinaceae	Gym.	2x = 24	1058	44.1	529	71	0.7
228. <i>P. rubens</i> Sarg.	Pinaceae	Gym.	2x = 24	885	36.9	442	59	0.8
229. <i>P. schrenkiana</i> Fisch. & Mey.	Pinaceae	Gym.	2x = 24	766	31.9	383	51	0.9
230. <i>Pieris japonica</i> D. Don	Ericaceae	Ang.	2x = 24	98	4.1	49	7	4.2
231. <i>Pinus aristata</i> Engelm.	Pinaceae	Gym.	2x = 24 ^h	1368	57.0	684	91	0.6
232. <i>P. banksiana</i> Lamb.	Pinaceae	Gym.	2x = 24	1091	45.5	546	73	0.7
233. <i>P. canariensis</i> C. Smith	Pinaceae	Gym.	2x = 24	1356	56.5	678	90	0.6
234. <i>P. caribaea</i> Morelet	Pinaceae	Gym.	2x = 24	959	39.9	479	64	0.8
235. <i>P. cembroides</i> Zucc. var. <i>monophylla</i> (Torr. & Frem.) Voss	Pinaceae	Gym.	2x = 24 ^h	1195	49.8	598	80	0.7
236. <i>P. contorta</i> Dougl.	Pinaceae	Gym.	2x = 24 ^h	1095	45.6	547	73	0.7
237. <i>P. densiflora</i> Sieb. & Zucc.	Pinaceae	Gym.	2x = 24	1498	62.4	749	100	0.6
238. <i>P. densiflora</i> Sieb. & Zucc. cv. <i>Umbraculifera</i>	Pinaceae	Gym.	2x = 24 ^h	1351	56.3	675	90	0.6

Species ^a	Family	Class ^b	Ploidy and chromosome number(2n)	Nuclear volume ^c (μm^3)	ICyd ^d (μm^3)	Genome volume ^e (μm^3)	Est. 3C DNA ^f (pg)	Est. LD50 ^g (kR)
239. <i>P. flexilis</i> James	Pinaceae	Gym.	2x = 24	1114	46.4	557	74	0.7
240. <i>P. griffithii</i> McClell.	Pinaceae	Gym.	2x = 24	1722	71.8	861	115	0.5
241. <i>P. leucodermis</i> Ant.	Pinaceae	Gym.	2x = 24	1328	55.3	664	89	0.6
242. <i>P. jeffreyi</i> A. Murr.	Pinaceae	Gym.	2x = 24	1733	72.2	866	116	0.5
243. <i>P. lambertiana</i> Dougl.	Pinaceae	Gym.	2x = 24	1577	65.7	789	105	0.5
244. <i>P. massoniana</i> Lamb.	Pinaceae	Gym.	2x = 24	1226	51.1	613	82	0.6
245. <i>P. nigra</i> Arnold	Pinaceae	Gym.	2x = 24	1226	51.1	613	82	0.6
246. <i>P. ponderosa</i> Dougl.	Pinaceae	Gym.	2x = 24 ^h	1321	55.0	660	88	0.6
247. <i>P. radiata</i> D. Don	Pinaceae	Gym.	2x = 24	1248	52.0	624	83	0.6
248. <i>P. resinosa</i> Ait.	Pinaceae	Gym.	2x = 24 ^h	1144	47.7	572	76	0.7
249. <i>P. rigida</i> Mill.	Pinaceae	Gym.	2x = 24	1159	48.3	579	77	0.7
250. <i>P. strobus</i> L.	Pinaceae	Gym.	2x = 24 ^h	1206	50.2	603	80	0.7
251. <i>P. strobus</i> L. cv. Pendula	Pinaceae	Gym.	2x = 24 ^h	812	67.7	812	54	0.5
252. <i>P. strobus</i> L. cv. Pumila	Pinaceae	Gym.	2x = 24 ^h	1564	65.2	782	104	0.5
253. <i>P. sylvestris</i> L.	Pinaceae	Gym.	2x = 24	1287	53.6	643	86	0.6
254. <i>P. taeda</i> L.	Pinaceae	Gym.	2x = 24	1895	79.0	948	126	0.5
255. <i>P. virginiana</i> Mill.	Pinaceae	Gym.	2x = 24	1107	46.1	554	74	0.7
256. <i>Platanus occidentalis</i> L.	Platanaceae	Ang.	2x = 42	240	5.7	120	16	3.3
257. <i>Podocarpus acutifolius</i> Kirk	Podocarpaceae	Gym.	2x = 38	349	9.2	175	23	2.3
258. <i>P. alpinus</i> R. Br.	Podocarpaceae	Gym.	2x = 38	494	13.0	247	33	1.8
259. <i>P. andinus</i> Poepp. ex Endl.	Podocarpaceae	Gym.	2x = 38	367	9.7	184	25	2.2
260. <i>P. brassii</i> Pilger	Podocarpaceae	Gym.	2x = 36 ^h	421	11.7	211	28	1.9
261. <i>P. coriaceus</i> L. C. Rich.	Podocarpaceae	Gym.	2x = 40 ^h	369	9.2	185	25	2.3
262. <i>P. dactyloides</i> A. Rich.	Podocarpaceae	Gym.	2x = 20	159	7.9	79	11	2.6
263. <i>P. elatus</i> R. Br.	Podocarpaceae	Gym.	2x = 36	460	12.8	230	31	1.8
264. <i>P. elongatus</i> (Alt.) L'Her.	Podocarpaceae	Gym.	2x = 22	297	13.5	149	20	1.7
265. <i>P. falcatus</i> R. Br.	Podocarpaceae	Gym.	2x = 24	272	11.3	136	18	2.1
266. <i>P. ferrugineus</i> D. Don	Podocarpaceae	Gym.	2x = 36	375	10.4	188	25	2.1
267. <i>P. gracillior</i> Pilger	Podocarpaceae	Gym.	2x = 24	332	13.8	166	22	1.7
268. <i>P. halli</i> Kirk	Podocarpaceae	Gym.	2x = 34	386	11.4	193	26	2.0
269. <i>P. imbricatus</i> Blume	Podocarpaceae	Gym.	2x = 20	211	10.5	105	14	2.1
270. <i>P. latifolius</i> (Thunb.) R. Br.	Podocarpaceae	Gym.	2x = 20	429	21.5	215	29	1.2
271. <i>P. macrophyllus</i> (Thunb.) D. Don	Podocarpaceae	Gym.	2x = 38	483	12.7	241	32	1.8
272. <i>P. milanjanus</i> Rendle	Podocarpaceae	Gym.	2x = 20 ^h	421	21.0	210	28	1.2
273. <i>P. nagii</i> (Thunb.) Makino	Podocarpaceae	Gym.	2x = 26	217	8.3	108	15	2.5
274. <i>P. nivalis</i> Hook. f.	Podocarpaceae	Gym.	2x = 38	568	15.0	284	38	1.6
275. <i>P. salignus</i> D. Don	Podocarpaceae	Gym.	2x = 38	609	16.0	304	41	1.5
276. <i>P. totara</i> D. Don ex Lamb.	Podocarpaceae	Gym.	2x = 34	487	14.3	244	33	1.7
277. <i>Populus tremuloides</i> Michx.	Salicaceae	Ang.	2x = 38	131	3.5	66	9	4.7
278. <i>Prunus amygdalus</i> Batsch cv. Nonpareil	Rosaceae	Ang.	2x = 16	61	3.8	31	4	4.4
279. <i>P. armeniaca</i> L. cv. Blenheim	Rosaceae	Ang.	2x = 16	103	6.4	51	7	3.0
280. <i>P. armeniaca</i> L. cv. Tilton	Rosaceae	Ang.	2x = 16	83	5.2	41	6	3.5
281. <i>P. avium</i> L. cv. Windsor	Rosaceae	Ang.	2x = 16	79	5.0	40	5	3.6
282. <i>P. X cerasus</i> L.	Rosaceae	Ang.	4x = 32	82	2.6	21	6	5.9
283. <i>P. X cerasus</i> L. cv. Montmorency	Rosaceae	Ang.	4x = 32	116	3.6	29	8	4.6
284. <i>P. domestica</i> L.	Rosaceae	Ang.	6x = 48	170	3.6	28	11	4.6
285. <i>P. glandulosa</i> Torr. & Gray	Rosaceae	Ang.	2x = 16	101	6.3	50	7	3.0
286. <i>P. laurocerasus</i> L.	Rosaceae	Ang.	22x = 176	560	3.2	25	37	5.0
287. <i>P. laurocerasus</i> L. cv. Schipkaensis	Rosaceae	Ang.	22x = 176	738	4.2	34	49	4.1
288. <i>P. persica</i> (L.) Patsh.	Rosaceae	Ang.	2x = 16	57	3.6	28	4	4.6

Species ^a	Family	Class ^b	Ploidy and chromosome number(2n)	Nuclear volume ^c (μm^3)	ICvd ^d (μm^3)	Genome volume ^e (μm^3)	Est. 3C DNA ^f (pg)	Est. LD50 ^g (kR)
289. <i>Pseudolarix amabilis</i> (Nelson) Rehd.	Pinaceae	Gym.	2x? = 44	1211	27.5	605	81	1.0
290. <i>Pseudotsuga douglasii</i> Carr.	Pinaceae	Gym.	2x = 26	742	28.5	371	50	1.0
291. <i>Pyrus malus</i> L. cv. McIntosh	Rosaceae	Ang.	2x = 34	112	3.3	56	8	4.9
292. <i>P. malus</i> L. cv. Northern Spy	Rosaceae	Ang.	2x = 34	123	3.6	61	8	4.6
293. <i>Quercus alba</i> L.	Fagaceae	Ang.	2x = 24	159	6.6	79	11	2.9
294. <i>Q. borealis</i> Michx. f. var. <i>maxima</i> (Marsh.) Ashe	Fagaceae	Ang.	2x = 24	145	6.1	73	10	3.1
295. <i>Q. coccinea</i> Muenchh.	Fagaceae	Ang.	2x = 24	86	3.6	43	6	4.6
296. <i>Q. ilicifolia</i> Wang.	Fagaceae	Ang.	2x = 24	108	4.5	54	7	3.9
297. <i>Q. marilandica</i> Muenchh.	Fagaceae	Ang.	2x = 24	80	3.3	40	5	4.9
298. <i>Q. prinus</i> L.	Fagaceae	Ang.	2x = 24	146	6.1	73	10	3.1
299. <i>Q. stellata</i> Wang.	Fagaceae	Ang.	2x = 24	105	4.4	53	7	4.0
300. <i>Q. velutina</i> Lam.	Fagaceae	Ang.	2x = 24	76	3.2	38	5	5.0
301. <i>Rhododendron viscosum</i> (L.) Torr.	Ericaceae	Ang.	2x = 26	88	3.4	44	6	4.8
302. <i>Rhus radicans</i> L.	Anacardiaceae	Ang.	2x = 30	54	1.8	27	4	7.7
303. <i>Ribes sativum</i> Syme cv. Red Lake	Saxifragaceae	Ang.	2x = 16	111	6.9	55	7	2.8
304. <i>Robinia pseudoacacia</i> L.	Leguminosae	Ang.	2x = 20	120	6.0	60	8	3.1
305. <i>Rubus ursinus</i> Cham. & Schlecht. var. <i>loganobaccus</i> Bail.	Rosaceae	Ang.	6x = 42	184	4.4	31	12	4.02
306. <i>Salix babylonica</i> L.	Salicaceae	Ang.	4x = 76	154	2.0	39	10	7.18
307. <i>Sambucus canadensis</i> L.	Caprifoliaceae	Ang.	2x = 36	581	16.1	290	39	1.5
308. <i>Sassafras albidum</i> (Nutt.) Nees.	Lauraceae	Ang.	4x = 38	283	5.9	71	19	3.2
309. <i>Saxegothea conspicua</i> Lindl.	Podocarpaceae	Gym.	2x = 24	140	5.9	70	9	3.2
310. <i>Sciadopitys verticillata</i> Sieb. & Zucc.	Taxodiaceae	Gym.	2x = 20	465	23.2	232	31	1.2
311. <i>Sequoia sempervirens</i> Endl.	Taxodiaceae	Gym.	6x = 66	1116	16.9	186	74	1.5
312. <i>Sequoiadendron giganteum</i> Buchholz	Taxodiaceae	Gym.	2x = 22	431	19.6	216	29	1.3
313. <i>S. giganteum</i> Buchholz cv. <i>Pendulum</i>	Taxodiaceae	Gym.	2x = 22	338	15.4	169	23	1.6
314. <i>Smilax rotundifolia</i> L.	Liliaceae	Ang.	2x = 32	287	9.0	143	19	2.3
315. <i>Taiwania cryptomerioides</i> Hayata	Taxodiaceae	Gym.	2x = 22	448	20.4	224	30	1.3
316. <i>Taxodium distichum</i> (L.) Rich.	Taxodiaceae	Gym.	2x = 22	302	13.7	151	20	1.7
317. <i>Taxus baccata</i> L.	Taxaceae	Gym.	2x = 24	375	15.6	187	25	1.6
318. <i>T. canadensis</i> Marsh.	Taxaceae	Gym.	2x = 24 ^h	690	28.7	345	46	1.0
319. <i>T. cuspidata</i> Sieb. & Zucc.	Taxaceae	Gym.	2x = 24	840	35.0	420	56	0.9
320. <i>T. cuspidata</i> Sieb. & Zucc. cv. <i>Aurescens</i>	Taxaceae	Gym.	2x = 24	644	26.8	322	43	1.0
321. <i>T. cuspidata</i> Sieb. & Zucc. cv. <i>Nana</i>	Taxaceae	Gym.	2x = 24 ^h	666	27.8	333	44	1.0
322. <i>T. media</i> Rehd. cv. <i>Matfieldii</i>	Taxaceae	Gym.	2x = 24 ^h	553	23.0	276	37	1.2
323. <i>T. pilaris</i>	Taxaceae	Gym.	2x = 24 ^h	587	24.5	294	39	1.1
324. <i>Tecomaria capensis</i> Spach.	Bignoniaceae	Ang.	2x = 34	59	1.7	30	4	8.0
325. <i>Tetracclinis articulata</i> (Vahl) Mast.	Cupressaceae	Gym.	2x = 22	326	14.8	163	22	1.6
326. <i>Thuja occidentalis</i> L.	Cupressaceae	Gym.	2x = 22	544	24.7	272	36	1.1
327. <i>T. occidentalis</i> L. cv. <i>Fastigiata</i>	Cupressaceae	Gym.	2x = 22 ^h	265	12.1	133	18	1.9
328. <i>T. orientalis</i> L.	Cupressaceae	Gym.	2x = 22	259	11.8	130	17	1.9
329. <i>T. plicata</i> D. Don	Cupressaceae	Gym.	2x = 22	283	12.9	142	19	1.8

Table 6 (cont.)

Species ^a	Family	Class ^b	Ploidy and chromosome number (2n)	Nuclear volume ^c (μm^3)	ICV ^d (μm^3)	Genome volume ^e (μm^3)	Est. 3C DNA ^f (pg)	Est. LD ₅₀ ^g (kr)
330. <i>T. standishi</i> (Gord.) Carr.	Cupressaceae	Gym.	2x = 22	443	20.1	221	30	1.3
331. <i>Thujaopsis dolabrata</i> (L. f.) Sieb. & Zucc.	Cupressaceae	Gym.	2x = 22 ^h	417	19.0	209	28	1.3
332. <i>T. dolabrata</i> (L. f.) Sieb. & Zucc. var. <i>hondai</i> Makino	Cupressaceae	Gym.	2x = 22	445	20.2	222	30	1.3
333. <i>Tilia americana</i> L.	Tiliaceae	Ang.	2x = 82	208	2.5	104	14	6.0
334. <i>Torreya nucifera</i> Sieb. & Zucc.	Taxaceae	Gym.	2x = 22	871	39.6	435	58	0.8
335. <i>Tsuga canadensis</i> (L.) Carr.	Pinaceae	Gym.	2x = 24	964	40.2	482	64	0.8
336. <i>T. caroliniana</i> Engelm.	Pinaceae	Gym.	2x = 24	970	40.4	485	65	0.8
337. <i>T. diversifolia</i> (Maxim.) Mast.	Pinaceae	Gym.	2x = 24	1264	52.7	632	84	0.6
338. <i>T. heterophylla</i> (Raf.) Sarg.	Pinaceae	Gym.	2x = 24	853	35.6	427	57	0.8
339. <i>Vaccinium angustifolium</i> Ait.	Ericaceae	Ang.	2x = 24	62	2.6	31	4	5.9
340. <i>V. corymbosum</i> L.	Ericaceae	Ang.	4x = 48	136	2.8	34	9	5.5
341. <i>V. macrocarpon</i> Ait.	Ericaceae	Ang.	2x = 24	56	2.3	28	4	6.4
342. <i>V. pallidum</i> Ait.	Ericaceae	Ang.	2x = 24	48	2.0	24	3	7.1
343. <i>Viburnum acerifolium</i> L.	Caprifoliaceae	Ang.	2x = 18	145	8.0	72	10	2.5
344. <i>V. cassinoides</i> L.	Caprifoliaceae	Ang.	2x = 18	200	11.1	100	13	2.0
345. <i>V. dentatum</i> L.	Caprifoliaceae	Ang.	6x = 54	392	7.3	65	26	2.7
346. <i>V. dilatatum</i> Thunb.	Caprifoliaceae	Ang.	2x = 18	277	15.4	138	19	1.6
347. <i>V. opulus</i> L. cv. <i>Nanum</i>	Caprifoliaceae	Ang.	2x = 18	357	19.8	178	24	1.3
348. <i>V. prunifolium</i> L.	Caprifoliaceae	Ang.	2x = 18	220	12.2	110	15	1.9
349. <i>V. sieboldi</i> Miq.	Caprifoliaceae	Ang.	4x = 32	515	16.1	129	34	1.5
350. <i>Vitis</i> sp. cv. <i>Concord</i>	Vitaceae	Ang.	2x = 38	97	2.6	49	7	5.9
351. <i>V. sp.</i> cv. <i>Delaware</i>	Vitaceae	Ang.	2x = 38	101	2.7	51	7	5.7
352. <i>V. labrusca</i> L.	Vitaceae	Ang.	2x = 38	77	2.0	39	5	7.1
353. <i>Welwitschia mirabilis</i> Hook. f.	Welwitschiaceae	Gym.	2x = 42	407	9.7	68	27	2.2
354. <i>Widdringtonia cedarburgensis</i>	Cupressaceae	Gym.	2x = 22	488	22.2	244	33	1.2
355. <i>W. cupressoides</i> (L.) Endl.	Cupressaceae	Gym.	2x = 22	426	19.4	213	28	1.3
356. <i>W. dracomontana</i> Stapf	Cupressaceae	Gym.	2x = 22	380	17.3	190	25	1.4
357. <i>W. juniperoides</i> (L.) Endl.	Cupressaceae	Gym.	2x = 22	395	18.0	197	26	1.4
358. <i>W. schwarzii</i> (Marloth) Mast.	Cupressaceae	Gym.	2x = 22	421	19.1	210	28	1.3
359. <i>W. whytei</i> Rendle	Cupressaceae	Gym.	2x = 22	402	18.3	201	27	1.4
360. <i>Yucca schidigera</i> Roez. ex Ortg.	Amaryllidaceae	Ang.	2x = 60	292	4.9	146	20	3.7
361. <i>Zamia floridana</i> A. DC.	Zamiaceae	Gym.	2x = 16 ^h	1778	111.1	889	119	0.4
362. <i>Z. pseudo-parasitica</i> Yates	Zamiaceae	Gym.	2x = 18	2348	130.5	1174	157	0.3

^aSubspecies, vars. and cultivars are all considered separately.

^bAngiosperma or gymnosperm.

^cNuclear volumes either determined from actively-growing material or, if from dormant material, converted to the active equivalent, as described in Sparrow, Rogers & Schwemmer (1964) and Sparrow, Schwemmer, Klug & Puglielli (1970a). Values listed here may differ from previously-published figures. In most such cases, the values given here are averages of several determinations. All volumes determined in A. H. Sparrow laboratory.

^dICVs were calculated before nuclear volumes were rounded off to whole numbers. Thus ICVs derived from the same apparent nuclear volume may not agree precisely.

^eThe volume of a single basic chromosome complement, estimated by dividing nuclear volume by ploidy level. Differences in genome volume, or in DNA per genome, have been shown to have possible evolutionary significance (Sparrow & Nauman, 1973, 1976).

^fEstimated from nuclear volume using the correlation demonstrated by Baetcke, Sparrow, Nauman & Schwemmer (1967). See also discussion in text and Figs. 1, 4.

^gEstimated from ICV as described in Sparrow, Rogers & Schwemmer (1968).

^hChromosome counts determined or confirmed in A. H. Sparrow laboratory. All others from the literature.