can be controlled, they seem to have limited potential in commercial production.

Langhans and Miller (5), Langhan and Larson (4) and others have found that critical photoperiod varies with night and day temperatures; and the higher the temperatures, the shorter the photoperiod necessary for flower initiation and the more short days required, but the faster the maturity of flowers and bracts. Apparently Florida's high light intensity and high day and night temperatures during October and much of November result in rapid development of poinsettia plants and flowers and makes possible a late propagation date. Results from these experiments and from preliminary experiments completed a year earlier indicate that a 16 hour dark period daily gives excellent flower initiation and development under conditions of relatively high and uncontrolled night temperatures.

SUMMARY

Five experiments were initiated to test dwarfing compounds and propagation dates and photoperiod control on height and flowering of pot-grown poinsettias. From two experiments using chemicals for height control, best results came from treatments in which cuttings were taken August 21, CCC applied 14 days after potting at the rate of ½ ounce of 50% material per three quarts of water and this solution applied at the rate of 2 fluid ounces per three inch pot. Such plants were lighted until October 10-15 and given 15 hour nyctoperiods until flowering.

Best results when chemicals were not used came when cuttings were made October 1 and 16 hour nyctoperiods given during and after propagation until flowers were mature. Manipulating propagating dates and photoperiod appear more desirable under Florida conditions than chemical treatments.

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STIMULATION OF PANSY BLOOM, NUMBER AND DIAMETER WITH GAMMA IRRADIATION

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Since the dawn of civilization man has been searching for simple and inexpensive techniques that will stimulate plant growth for his use. This search still goes on today. The application of ionizing radiations to plants and plant parts has received a great deal of attention since the turn of the century. There have been many claims, which were based on both controlled and uncontrolled experiments, that irradiation in some way stimulates plant growth. Because of the large number of reports and reviews on this subject, no effort will be made to present another review here. Only certain reports will be cited.

Florida Agricultural Experiment Stations Journal Series No. 1514.

Breslavets (2), in a review of some of the literature published before 1946, mostly her own and that of her Russian colleagues concluded that irradiation does in fact stimulate plant growth if it is given under controlled conditions. Her conclusion, that this stimulation is of sufficient magnitude to be of economic importance, is questioned by a number of research workers in this country. The work of Sparrow and Christensen (7) showed no beneficial effects in the irradiation of potatoes except possibly better germination. Sax (5) reported no significant stimulation of a number of garden crops except earlier flowering in one species, gladiolus. Spencer (8) also reported earlier flowering the first season after the irradiation of corms of several monocots. Other workers (1, 3, 4) have reported stimulation in very specific characters of plants such as degree of branching, chemical content, etc. None of the effects of stimulation seem to be of sufficient magnitude to have very great economic importance, yet there always exists the possibility that a small amount of radiation will stimulate a character which does have economic importance. This point is implied in a summary statement made by Sparrow (6). The statement is in part as follows: "The growth responses of plants to acute or chronic exposures of ionizing radiations vary with the species or variety, the dose rate, the length of exposure, and a number of other factors. Simple growth inhibition is one of the most commonly observed effects, but not infrequently, growth stimulation is also expressed in one or more of a number of possible forms. The response may be general or, more often, it is localized in one to several typical positions. For instance, the response in leaves varies from complete growth inhibition, to localized inhibition, to local or generalized proliferation. Stems may also show partial growth inhibition or a change of growth pattern to produce one or more of the following effects: (1) overall growth inhibition, (2) localized inhibition, (3) increased lateral or (4) linear growth, (5) abnormal meristematic activity, (6) an increase in the degree of branching, (7) production of abnormal parts. Abnormalities in the number, size, form and distribution of floral structures also commonly occur."

In 1961, Mr. Harry Lydick, one of the Gainesville High School science instructors, reported (personal communication) that irradiation of pansy seeds increased the number and diameter of blooms per plant. The stimulation appeared to be sufficiently large to be of economic importance. Unfortunately, Mr. Lydick used only one

Table 1. Mean number of blooms per plant for each pansy variety irradiated. Data summarized for each month on all treatments.

Month	Irradiation Treatments (kiloroentgens)				
Harvested	0	2.5	5.0	7.5	10.0
Variety: Swiss Giant Redskin					
February	1.7	1.4	1.6	1.6	2.2
March	5.3	5.1	4.1	4.7	5.0
April	21.7	24.9	16.8	20.8	23.1
Total	28.7	31.3	22.9	27.1	30.3
Variety: F_1 Hybrid White					
February	2.2	2.6	3.2	3.1	2.0
March	7.5	10.2	12.6	10.1	9.5
April	35.3	34.4	38.3	34.2	32.1
Total	44.9	47.2	54.0	47.4	43.7
Variety: Swiss Giant Lake of Thun					
February	0.9	0.9	0.7	0.8	1.0
March	6.4	8.1	5.7	8.3	8.0
April	17.9	21.3	17.2	24.2	18.7
Total	25.0	30.4	23.6	33.1	27.7
Variety: Swiss Giant Paper White					
February	2.6	2.3	2.0	2.3	2.3
March	6.7	5.5	4.7	4.8	5.8
April	41.4	34.6	29.4	25.6	34.1
Total	45.8	42.4	35.8	32.8	42.3

replication in his project. Since a large number of factors may influence radiation effects on plants, we decided to repeat Mr. Lydick's experiment under controlled conditions using four varieties of pansies. They were Swiss Giant Redskin, F_1 Hybrid White, Swiss Giant Lake of Thun, and Swiss Giant Paper White. Pure seed were obtained from George J. Ball, Inc., Chicago.

Methods

Seeds of the four varieties of pansies were equilibrated to 10% moisture content; were irradiated with Cobalt-60 gamma rays at the dosages 0, 2,500, 5,000, 7,500, 10,000 roentgens; and were planted within 2 hours after being irradiated in sterile soil in a growth room. The intensity of the irradiation was approximately 3,000 roentgens per minute. When the seedlings were large enough, they were transplanted to plant bands; and on January 16, 1962 the entire plant band containing the seedling was transplanted to the experimental plot. The experimental design was a randomized block with six replications. Each plot consisted of five plants spaced 12 inches apart in 18 inch rows for each of the treatments. As the blooms opened fully, they were clipped and measured in millimeters. Clipping was terminated at the end of April. Over 27,000 blooms were clipped and measured.

Results

For brevity's sake, the assembled data are presented on a mean per plant basis. Table 1 presents the mean number of blooms per plant

Table 2. Mean bloom diameter for each pansy variety irradiated. Data summarized for each month on all treatments.

Month Harvested	Irradiation Treatments (kiloroentgens) 0	2.5	5.0	7.5	10.0
Variety: Swiss Giant Redskin					
February	50.0	48.2	45.5	48.4	49.0
March	47.6	47.9	46.1	48.5	47.4
April	43.0	43.5	41.5	41.7	43.3
Total	44.4	44.4	42.6	43.0	44.4
Variety: F_1 Hybrid White					
February	57.0	58.4	58.9	59.7	63.0
March	56.8	56.9	56.3	56.9	57.6
April	52.0	50.1	51.2	52.4	52.4
Total	53.0	52.1	53.2	53.8	54.0
Variety: Swiss Giant Lake of Thun					
February	52.4	53.8	51.8	52.5	51.8
March	51.3	49.6	47.8	49.9	50.6
April	45.3	43.9	44.2	44.6	45.1
Total	47.4	47.0	44.8	46.1	47.2
Variety: Swiss Giant Paper White					
February	51.5	51.7	51.6	52.0	52.2
March	49.8	48.4	49.5	49.6	48.1
April	47.4	46.4	47.4	47.3	46.9
Total	48.0	46.9	47.8	48.1	47.7

Table 3. Mean squares and F values from analyses of variance of number of blooms and diameter of blooms harvested from plants grown from irradiated pansy seeds.

Source of Variance	d.f.	Bloom Number: Mean Squares	Bloom Number: F Value	Bloom Diameter: Mean Squares	Bloom Diameter: F Value
Replications	5	414.20		12.12	
Varieties	3	2235.58	15.08***	463.00	83.6***
Irradiation Treatments	4	51.25	N.S.	4.35	N.S.
Var. x Irr. Treatments	12	143.56	N.S.	3.53	N.S.
Variety x Replications	15	148.24		5.54	
Irr. Treat. x Replications	20	135.19		3.14	
Var. x Irr. Tr. X Reps.	60	95.05		3.15	

*** = Highly significant.

for each of the varieties; the mean diameter data are in Table 2. The analyses of variance were calculated on the individual plant totals only. The mean squares from these analyses are presented in Table 3.

As indicated by the F values in the analyses of variance presented in Table 3, there were no significant differences between the irradiation treatments for the number of blooms per plant or the diameter of these blooms. Furthermore, these F values show that there were no significant variety-by-irradiation-treatment interactions, indicating that all of the varieties responded to the irradiation in the same direction. There were, however, significant differences between the different varieties in their bloom production and the diameter of the blooms produced. The F_1 Hybrid White produced a few more blooms and the largest blooms. Since data were not taken after April, it is not known if the F_1 Hybrid would have continued to be the best performer. The second best productive variety was Swiss Giant Paper White. The other two varieties were not nearly as productive as the first two named.

These results indicate a slight stimulation from the irradiation to the F_1 Hybrid White in the production of blooms during February and March. However, the number of flowers produced during these two months is so small as compared with the number produced in April that the slight stimulation would be economically insignificant. For this reason the analyses of variance were calculated only on the totals. It also may be pointed out that the size of blooms decreased in late spring as the seasonal temperature rose.

Discussion

The results reported in this experiment indicate clearly that irradiation of seeds did not increase the bloom number or size under the conditions tested. The error terms from the analyses of variance are relatively small, indicating a fairly well controlled experiment.

The fact that irradiation of pansy seeds did not increase the number of blooms or the size of blooms in this experiment is not a guarantee that irradiation would not be economically beneficial with other varieties under different conditions. It is, however, an indication that great care must be observed in interpreting results from radiation stimulation experiments. The number of factors which can modify the results are so great that the experiments must be repeated to insure that the results are valid. This is especially true if expansion from experimental plot size to large commercial operations is contemplated.

A final point should be made; the lack of positive results in the experiment reported here should not discourage similar experiments with other crops. Because the effects of ionizing radiation vary so greatly with different plants and even from one part of the plant to another, any "lead" that indicates growth stimulation resulting from irradiation should be thoroughly investigated. This is especially true in the ornamental crops industry, which depends heavily on vegetative performance.

Summary

Seeds from four varieties of pansies (Swiss Giant Redskin, F_1 Hybrid White, Swiss Giant Lake of Thun, Swiss Giant Paper White) were equilibrated to 10% moisture content and irradiated with Cobalt-60 gamma rays at 0, 2,500, 5,000, 7,500, and 10,000 roentgen units. The young seedlings were transplanted to the field in a randomized block design with six replications. During the months of February, March, and April, each bloom from each plant was clipped and its diameter measured in millimeters. The results show that irradiation of the seeds did not increase the number of blooms or the diameter of the blooms produced. The variety by treatment interactions were not significant in the analysis of variance. There were, however, significant differences between the varieties independent of the irradiation treatments. The F_1 Hybrid White and the Swiss Giant Paper White produced the largest numbers of blooms, while the F_1 Hybrid produced the largest blooms. These data should not be interpreted to indicate that radiation will not stimulate the growth of plants or plant parts, but they do indicate that all irradiation experiments for the purpose of stimulating plant growth should be repeated before conclusions are drawn.

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EFFECTS OF FERTILIZATION RATES AND FREQUENCIES ON POTTED CHRYSANTHEMUM PRODUCTION[1]

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In recent years the production of potted chrysanthemums in Florida has increased markedly. Fertilizer practices vary greatly from one area to another. In 1957 Wolz (3) indicated that excellent potted chrysanthemums could be produced by mixing 3 to 6 grams of Dura-K per 6-inch pot pre-set plus a weekly fertilization with 0.5 grams of ammonium nitrate. Ying and Joiner (4) reported that a single application of milorganite, uramite, or ammonium nitrate failed to give optimum growth or flowering response of potted chrysanthemums. Matkin et al. (1) demonstrated that a single application of an ion-exchange fertilizer, Tydex C, was definitely inferior to constant liquid fertilizing for the production of potted plants.

The objective of this study was to determine the optimum fertilizer rate and frequency of application for potted chrysanthemums grows under natural saran in southern Florida.

Methods

Four nutrition experiments were conducted during the 1961-62 season. Each experiment contained 4 fertilizer rates and 3 frequencies of application combined factorially with 4 replications. Five rooted cuttings per 6-inch azalea pot constituted the experimental unit. The Oregon variety was grown in experiments I and III and Delaware variety in experiments II and IV. The soil mixture was 2/3 virgin Leon fine sand plus 1/3 German peat with 4 grams of dolomite per pot. Each pot was given a commercial index rating based on scale of 6 to 30 where 6 was very poor, 12 poor, 18 fair, 24 good, and 30 excellent. A value of 12 or less was considered not salable.

[1]Plants for this study were furnished by California-Florida Plant Company, Stuart, Florida, and Yoder Brothers, Inc., Barberton, Ohio.
Florida Agricultural Experiment Stations Journal Series No. 1516.