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Effects of IBA and NAA on shoot growth of cuttings of various ornamental plants in water as rooting medium

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Abstract
The investigation entitled A study on effects of IBA and NAA on rooting and shoot growth of cuttings of various ornamental plants in water as rooting medium in Prayagraj at the Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology And Sciences (SHUATS), Prayagraj during the year 2019. The experiment was laid out in factorial complete randomized design (FCRD) with 20 treatments and 3 replications. All 20 possible combinations of 4 plants (acalypha, croton, dracaena, hibiscus) and 5 chemical treatments (water, IBA @ 50 ppm, IBA @ 100 ppm, NAA @ 50 ppm, NAA @ 100 ppm). It is concluded that most suitable chemical treatment for ornamental stem cuttings was T_2 (IBA 100 ppm), suitable ornamental stem cutting was P_2 (croton) and interaction of ornamental stem cutting and chemical treatment was P_2T_2 (croton + IBA 100 ppm) among all chemical treatment combination.

Keywords: Ornamental cuttings, chemical treatments

Introduction
Ornamental plants are used in landscapes and throughout the home to beautify the surroundings. A large, tropical plant in a living room provides a pop of color and helps soften harsh lines from furniture and architectural design. Colorful flowering ornamental plants break up the browns and greens that naturally occur outside. A large dogwood tree in the center of the front yard awakens with brilliant pink or white blossoms to flood the yard with color in spring. For creating a good landscape good planting material are also needed for ornamental plants. They're for propagation is an important aspect.

Cutting technique is the widely utilized vegetative method for propagating different plant species. Commercial propagators have developed techniques that successfully manipulate environmental conditions to maximize rooting of cuttings. The success of rooting of cuttings is affected by many factors. such as the plant part's age and its location on the plant, nutritional levels of the stock plants, seasonal timing, cuttings type used, rooting medium and environmental manipulation and treatments of cuttings. Some plants root better at a particular stage of growth, at a specific time of the year, or using a particular technique Seasonal timing or the period of the year in which cuttings are taken, could play an important role in rooting of plant species especially woody plants (Harrison-Murray 1991). With many plant species there is an optimal period of the year for taking cutting materials and consequently rooting (Anand and Haberlein 1975). In woody perennials, types of cutting materials to use range from softwood terminal shoot of current growth to dormant hardwood cuttings. There is no universal or ideal rooting medium for cuttings. Appropriate rooting medium depends on the species, cutting type, season, propagation system, and the cost and availability of the medium components (Hartmann *et al*, 1997).

Propagation for many plants is best done in potting soil, but some plants can be propagated in water. Water propagation using water as a medium to root cuttings. Unrooted cuttings require water to prevent desiccation (death) and for processes such as photosynthesis, which influence root development and growth. Water propagation is using water as a rooting medium to plant cuttings. Water propagation for succulents is exactly that, rooting succulent cuttings in water. Water propagation is such a fun and rewarding way to increase your plant collection either for yourself, or for family and friends! There are even many houseplants that can easily be rooted using just water that anyone had never imagined it could be rooted this way. Rooting plants in water is a way of propagating new plants using only water.

Materials and Methods

The present investigation was conducted on A study on effects of IBA and NAA on rooting and shoot growth of cuttings of various ornamental plants in water as rooting medium during the year 2019-2020. Planting materials were procured from Department of Horticulture treated with the rooting media (IBA & NAA) than placed into the container containing water. The experiment was laid out in Factorial Completely Randomized Design (FCRD) with three replications and the data were analyzed.

Results and discussion

Shoot parameters

Days taken to 1st sprouts

Among various ornamental cuttings, minimum days taken to 1" sprouting (9.33) was observed in P_4 (hibiscus) followed by (10.93) in P_1 (acalypha) and maximum days (15.73) was recorded in P_3 (draceana). Among various rooting hormone, minimum days taken 1 sprouting (11.80) was observed in T_2 (IBA @100 ppm) followed by (11.958) in T_3 (NAA @ 50 ppm) and maximum days (14.35) was observed in T_1 (IBA @ 50ppm)Among the interaction effect of ornamental cuttings and rooting hormone minimum days taken to 1st sprouting (8.0) was observed in P_4T_2 & P4T0 (hibiscus + IBA @ 100 ppm) & (hibiscus + control) followed by (9.16) in P_4T_2 (hibiscus + IBA @ 50 ppm) and maximum days (19.16) in P_3T_2 (dracaena + IBA @ 50 ppm).

Days taken to 50% sprouting

Among the various ornamental cuttings, minimum days taken to 50% sprouting (13.83) was observed in P_4 (hibiscus) followed by (14.93) in P1 (acalypha) and maximum days taken (20.73) was recorded in P_3 (draceana). Among various rooting hormone, minimum days taken to 50 % sprouting (15.833) was observed in T_2 (IBA @ 100 ppm) followed by (16.04) in T1(IBA @ 50 ppm) and maximum days (19.66) was observed in T3 (NAA @ 50 ppm). Among the interaction effect of ornamental cutting and rooting hormone minimum days taken to 50% sprouting (12.33) was observed in P_4T_1 (hibiscus + IBA @ 50 ppm) followed by (12.50) in P_4T_0 (hibiscus + control) and maximum days (24.16) in P_3T_3 (draceana + NAA @ 50 ppm).

Sprouting percentage

Among various ornamental cuttings, maximum percentage of sprouting (40.86) was observed in P_2 (croton) followed by (38.59) in P_3 (draceana) and minimum percentage of sprouting (29.33) was observed in P_1 (acalypha). Among various rooting hormone, maximum percentage of sprouting (43.33) was observed in T_2 (IBA @ 100 ppm) followed by (36.49) in T_0 (control) and minimum percentage of sprouting (28.50) was observed in T_3 (NAA @ 50 ppm). Among the interaction effect of ornamental cuttings and rooting hormone maximum percentage of sprouting (71.66) was observed in P_2T_2 (croton + IBA @ 100 ppm) followed by (64.33) in P_3T_0 (dracaena + control) and minimum in (20.000) was observed in P_4T_0 (hibiscus + control water) & followed by (21.83) in P_1T_4 (acalypha + NAA @ 50 ppm)

Number of sprouts per cuttings

Among various ornamental cuttings, maximum number of sprouts per cuttings (4.94) was observed in P_2 (croton) followed by (3.33) in P_1 (acalypha) and minimum number of sprouts per cuttings (1.66) was recorded in P_3 (draceana) followed by (2.56) in P_4 (hibiscus). Among various rooting hormone maximum number of sprouts per cuttings (3.72) was observed in T_2 (IBA @ 100 ppm) followed by (3.30) in T_1 (IBA @ 50 ppm). Among the interaction effect of ornamental cuttings and rooting hormone maximum number of sprouts per cuttings (5.88) was observed in P_2T_2 (croton + IBA @ 100 ppm) followed by (5.33) in P_2T_1 (Croton + NAA 100 @ ppm) and minimum number of sprouts per cuttings (1.00) in P_3T_0 (draceana+control water) followed by (1.50) in P_3T_1 (draceana + IBA @ 50 ppm)

Length of the first shoot (cm)

Among the various ornamental cuttings, maximum length of the first shoot (5.83) was observed in P_2 (croton) followed by (3.68) in P_1 (acalypha) and minimum length of the first shoot (2.46) was recorded in P_4 (acalypha), followed by (2.90) in P_3 (draceana). Among the various rooting media, maximum length of the first shoot (4.01) was observed in T_2 (IBA @ 100 ppm) followed by (3.85) in T_3 (NAA @ 50 ppm) and maximum length of the first shoot (3.27) was observed in T_1 (IBA @ 50 ppm) followed by (3.65) in T_4 (NAA @ 100 ppm). Among the interaction effects of ornamental cuttings and rooting hormone maximum length of the first shoot (6.63) was observed in P_2T_0 (croton+control water) followed by (6.33) in P_2T_3 (croton + NAA @ 50 ppm) and minimum length of the first shoot (1.90) in P_3T_3 (draceana +NAA @ 50 ppm) followed by (2.13) in P_4T_1 (hibiscus + IBA @ 50 ppm).

Treatment	Days to 1st sprout	50% sprouting	Sprouting percentage	No. of sprouts per cuttings	Length of first sprout	Girth of the first shoot
T_0	12.2	16.3	36.4	2.5	3.8	4.3
T_1	14.3	16.0	33.6	3.3	3.2	4.3
T_2	11.8	15.8	43.3	3.7	4.0	4.6
T_3	11.9	19.6	28.5	2.9	3.8	4.2
T_4	12.4	16.2	35.5	3.1	3.6	4.1

Conclusion

On the basis of the results obtained from the present investigation, it is concluded that most suitable chemical treatment for ornamental stem cuttings was T_2 (IBA @ 100 ppm), suitable ornamental cutting was P_2 (croton) and interaction of rooting hormones and ornamental cutting was T_2P_2 (IBA @ 100 ppm + croton) among all rooting medium combination. Among all the chemical treatments IBA @ 100 ppm was found best but the cost was comparatively high when compared with NAA @ 50 ppm and NAA @100 ppm.

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