ROOTING OF CHRYSANTHEMUM CUTTINGS ON DIFFERENT TYPES OF GROWING MEDIA AND GROWTH REGULATORS

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ABSTRACT

Chrysanthemum is one of the most popular cut flower in the world stands next to rose, belongs to the family Asteraceae. They are native to Asia and north eastern Europe. Chrysanthemum is one of the common bedding plants used in landscaping and also used in luxurious floral arrangements. The chrysanthemum plants have the ability to grow from stem cuttings. The present study was conducted at the Department of Horticulture, Faculty of Agriculture, Annamalai University, Tamil Nadu, India, during September and October 2016. The experiment was laid out in Completely Randomized Block design with seventeen treatments and each treatment replicated thrice, to determine the chrysanthemum cuttings response to growth regulators and growing media combination. Growth regulator used are indole-3-butyric acid (IBA) and naphthalene acetic acid (NAA) at 75 ppm and 100 ppm concentrations. Growing media used in the study are rice husk, coco peat, vermiculite and leaf mould. The combination of growth regulators and growing media shown significant results on all rooting and growth parameters. Among the different concentrations and combinations used coco peat + 100 ppm IBA (T_6) recorded best results in number of leaves, shoot weight (g), root weight (g), root length (cm), and number of visible roots in chrysanthemum cuttings. Number of days taken for faster rooting and bud sprouting were early in cuttings planted on the coco peat medium treated with 100 ppm IBA.

Keywords: Chrysanthemum, IBA, NAA, Growing media.

INTRODUCTION

Chrysanthemum is one of the common bedding plants used in landscaping and also extensively used in various floral arrangements. The name chrysanthemum is derived from the Greek words Chryos means gold and Anthemon means flower. These flowers are native of Asia and North-East Europe. Chrysanthemum genus contains of about 40 species of flowering plants in the aster family Asteraceae, native primarily to subtropical and temperate areas of the World. Chrysanthemums are especially common in East Asia. Cultivated species, often called mums, are grown as fall-blooming ornamentals and are important in the floral industry. Florist chrysanthemum have more than 100 cultivars, including button, pompon, daisy, and spider forms. Most plants of the genus are perennial herbs or shrubs and have simple aromatic leaves that alternate along the stem. Some have both disk and ray flowers in the heads, but others lack ray or disk flowers. Chrysanthemums species cultivated and hybrids have large flower heads and those of wild species are much smaller. Among the most popular flowers chrysanthemum stands next to rose. Chrysanthemums start blooming early in the autumn. It have the ability to grow from stem cuttings. Each cutting should be minimum 7 cm long and have some foliage so that photosynthesis can occur, and each cutting produce energy to generate roots. The rooting capacity is not only determined by the genotype, but also by environmental conditions (Horridge and Chockshull 1989). For optimal growth of plants, growing media must contain enough water holding capacity and with good physical and chemical properties. Favourable environmental conditions which facilitate good rooting process of the cuttings are physical environments and edaphic factors that may act solely or simultaneously to the cuttings in root initiation and further root growth (Mass and Anderson, 1975 and Pal and Rajeevan, 1992).

Soil alone as a growing medium does not fulfil all requirements for its better growth and flowering quality. The use of growing media offers a valuable alternative to conventional use of soil for quality flower production due to their good water holding capacity, aeration and nutrient status (Bergi, 2011). Soilless substrates are used in horticulture for growing seedlings, plant propagation and growing plants (Ahmad 2012). Most of the light weight, soilless media are combinations of two or more components with desirable physical and chemical properties. Coco peat can hold large quantities of water and can be used in soil mixtures or as a soilless substrate for plant cultivation (John Mason, 2003). The fast and dynamic trend in the floriculture market made quality and performance as the determining factors in grading and pricing. Due to lack of proper cultivation method, cut flowers produced by growers have poor physical performance and quality. The present experiment was carried out to find the response of chrysanthemum cuttings on the rooting by the application of different growth regulators and growing media combinations.

MATERIALS AND METHODS

The experiment on the rooting of cuttings was conducted at the Department of Horticulture, Faculty of Agriculture, Annamalai University during September and October 2016. Chrysanthemum cuttings with uniform size of 13 cm long were planted in grow bag of 8 x 15 cm size as one cutting planted in each bag. The variety used in the experiment was Co 1, having yellow coloured flowers. The study was conducted in completely randomized block design with seventeen treatments replicated thrice. The experiment consist of growth regulators and growing media in different combinations used in the rooting of Chrysanthemum cuttings. The treatment consist of growth regulators indole-3-butyric acid (IBA) and naphthalene acetic acid (NAA) at 75 ppm and 100 ppm concentrations. Growing media used in the study are rice husk, coco peat, vermiculite and leaf mould. The performances of the cuttings were recorded at 15 th, 30 th and 45 th day. At the time of recording the observations, cutting were carefully uprooted and washed in running water to remove the media particles. Parameters evaluated were number of leaves, shoot weight (g), root weight (g), root length (cm), number of visible roots, days taken for rooting and days taken for bud sprouting. To facilitate humidity for the cuttings, water was sprayed to each planting bags with hand sprayer before the cuttings were planted and kept in nursery covered with shade net.

RESULTS AND DISCUSSION

Among the different treatments used in the experiment, combination of growth regulator and growing media significantly influenced overall performances of Chrysanthemum plants and best performance was recorded in the treatment T_6 ie, coco peat + 100 ppm IBA. Chrysanthemum cuttings treated with coco peat + 100 ppm IBA produced better rooting as compared with other treatment combinations on the 15 th, 30 th and 45 th days followed by Rice husk + 100 ppm IBA (T_2) and least rooting was observed in control (T_{17}), without growth regulator application and soil medium (Table 1, 2 & 3). The higher number of visible roots, longer roots and faster rooting (Fig. 1) was observed on the cuttings grown in coco peat may be attributed with its better physical characteristics, aeration and water holding capacity and also the chemical characteristics, nutritional status, salinity level have a crucial role on plant development (Dewayne *et al*., 2003, Singh *et al.*, 2003). Coco peat contains high carbon and nitrogen (C: N) ratio, with 35 per cent to 54 per cent lignin content and pH of 4.9-6.14 (Abad *et al*., 2002) facilitate better rooting, producing higher number of visible roots and increased length of the roots. During favourable conditions plant was provided sufficient air and oxygen for cell respiration during the rooting process (Frenck and Kim 1995).

Number of visible roots, length of the roots and faster rooting significantly affect growth regulator application and roots increase with increased concentration of growth regulator application (Table 1, 2 & 3) (Fig.

1). Root development is highly dependent on auxin and auxin transport (Uma and Gowda, 1991). Lateral roots originate in the root pericycle, in which individual quiescent cells are stimulated to dedifferentiate and proliferate to form the lateral root primordium and it differentiate and elongate, causing the lateral root to emerge through the primary root epidermis (Blakely and Evans, 1979). Several lines of evidence indicate that auxin is necessary for the development of lateral roots. Application of IBA to growing plants stimulates lateral root development and lateral root elongation (Torrey, 1950; Blakely *et al*., 1982).

The maximum number of leaves and shoot fresh weight was recorded in coco peat + 100 ppm IBA (T_6), followed by Rice husk + 100 ppm (T_2) and least rooting was observed in control (T_{17}) (Table 1, 2 & 3). Increase in leaf number may be due to their significant effect on inducing vigorous rooting system by growth regulators thus enabling the cuttings to absorb more nutrients thereby producing more leaves as reported by Prati *et al.* (1999) and Stancato *et al.* (2003). The increase in leaves and shoot weight from the growing media coco peat is due to its better physical and chemical characteristics, nutritional status etc. coco peat contains equal portions of lignin and cellulose and is rich in potassium and the micronutrients Fe, Mn, Zn, and Cu in available forms during mineralization and improving physical and chemical properties of soil (Chaterjee, 2005).

Days taken for bud sprouting was significantly affected with growth regulator and growing medium application, minimum number of days taken for sprouting of 8.73 days (Fig. 2) was noted in coco peat + 100 ppm IBA (T_6) indicating the effect of growth regulators and medium on fastening the bud sprouting. The maximum days taken to bud sprouting was observed in control. The early bud sprouting on T_6 is due to higher metabolic activity causing a greater flow of metabolites to the growing bud (Sun & Chen. 1998) and due to the growth promotive effect of coco peat which contain N 0.26 per cent, P_2O_5 0.01 per cent, K_2O 0.78 per cent and high lignin (Prabhu *et al*., 1983, Nagarajan *et al*., 1985 and Savithri and Khan 1994). The effect of IBA is in concurrence with other studies where IBA is the most commonly used auxin for root formation (Pooja Goyal, 2012). When rooting becomes faster it induces shoot growth and produces new bud sprouts.

Table 1 - Effect of growing media and growth regulator on the rooting and growth of Chrysanthemum cuttings on 15 th day

Growth Regulator	weight of root(g)	weight of shoot(g)	Number of visible root	Root length (cm)	Number of leaves
T_1 - Rice husk + 75 ppm IBA	1.67	2.43	3.23	2.19	2.02
T_2 - Rice husk + 100 ppm IBA	1.98	2.67	3.88	2.42	2.21
T_3 - Rice husk + 75 ppm NAA	1.23	2.32	3.28	2.39	1.87
T_4 - Rice husk + 100 ppm NAA	1.43	2.71	3.13	2.18	1.68
T_5 - coco peat + 75 ppm IBA	1.84	2.54	3.15	2.34	1.97
T_6 - coco peat + 100 ppm IBA	2.02	2.86	3.91	2.59	2.29
T_7 - coco peat + 75 ppm NAA	1.92	2.32	2.69	2.16	1.69
T_8 - coco peat + 100 ppm NAA	1.56	2.61	3.73	2.21	2.24
T_9 - vermiculite + 75 ppm IBA	1.82	2.12	2.89	2.38	1.74
T_{10} - vermiculite + 100 ppm IBA	1.47	2.25	2.78	2.67	1.39
T_{11} - vermiculite + 75 ppm NAA	1.39	1.87	2.34	1.89	1.54
T_{12} - vermiculite + 100 ppm NAA	1.23	2.03	2.19	2.12	1.32
T_{13} - leaf mould + 75 ppm IBA	1.18	1.96	2.79	1.96	1.58
T_{14} - leaf mould + 100 ppm IBA	1.61	1.89	2.73	2.01	1.43
T_{15} - leaf mould + 75 ppm NAA	1.24	1.81	2.17	1.75	1.29
T_{16} - leaf mould + 100 ppm NAA	1.42	1.83	2.02	1.92	1.54
T_{17} - Control	0.84	1.79	0.92	1.03	0.73
S.Ed.	0.07	0.12	0.13	0.10	0.09
CD (P=0.05)	0.15	0.25	0.27	0.21	0.19

Fig 1 - Effect of growing media and growth regulator on days taken for rooting of Chrysanthemum cuttings

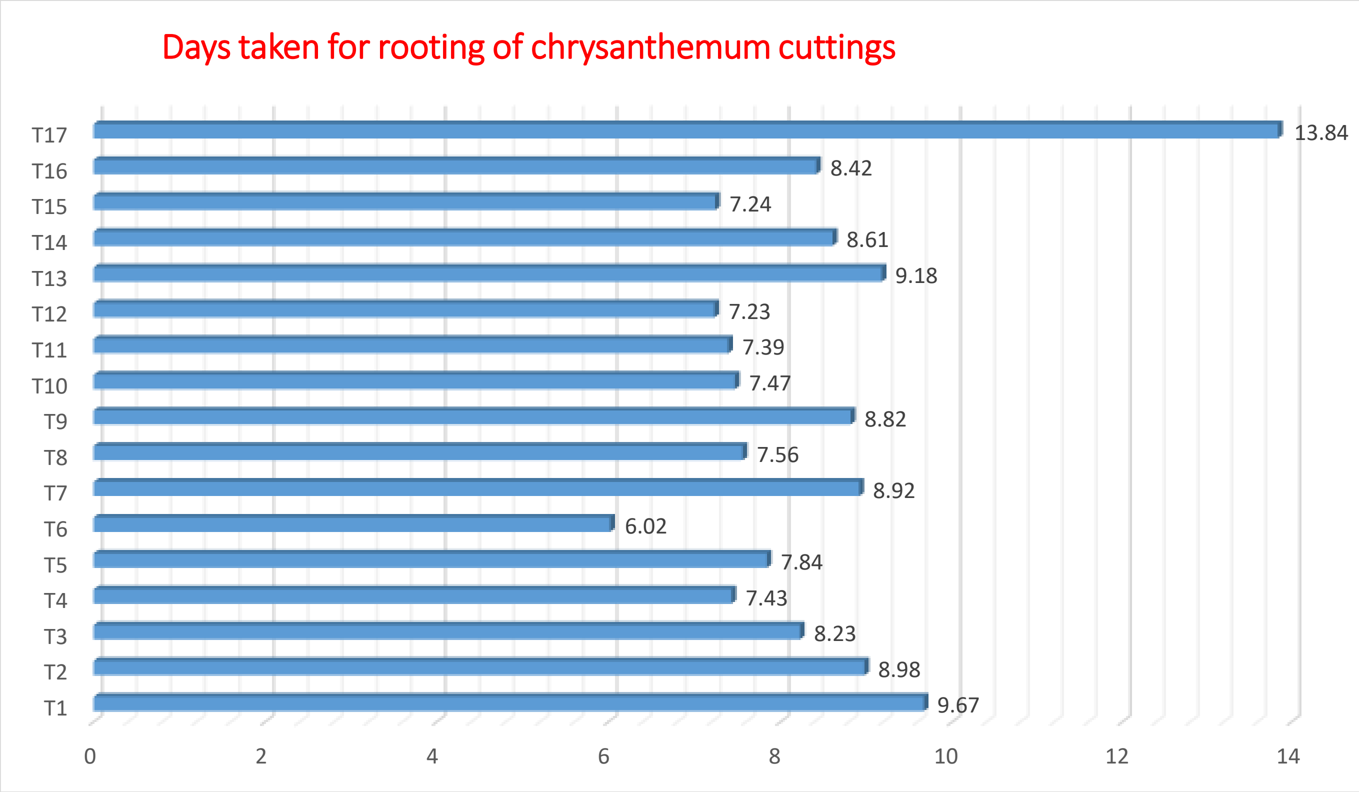


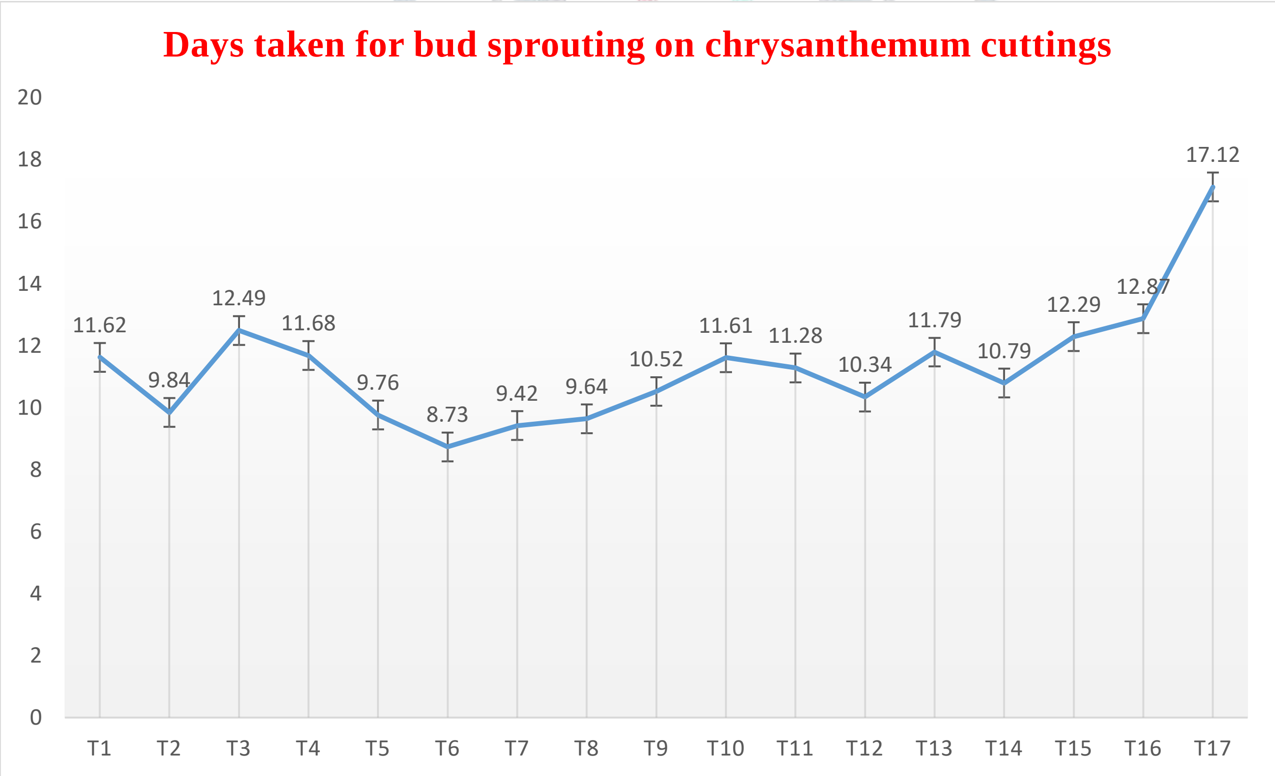
Table 2 - Effect of growing media and growth regulator on the rooting and growth of Chrysanthemum cuttings on 30 th day

Growth Regulator	Weight of root (g)	Weight of shoot (g)	Number of visible root	Root length (cm)	Number of leaves
T_1 - Rice husk + 75 ppm IBA	3.06	3.38	4.23	4.29	4.21
T_2 - Rice husk + 100 ppm IBA	3.23	3.87	4.82	4.43	4.62
T_3 - Rice husk + 75 ppm NAA	3.13	3.23	4.22	4.13	4.03
T_4 - Rice husk + 100 ppm NAA	2.87	3.42	4.68	4.02	3.97
T_5 - coco peat + 75 ppm IBA	3.19	3.15	3.97	3.76	3.76
T_6 - coco peat + 100 ppm IBA	3.42	3.92	4.98	4.61	4.71
T_7 - coco peat + 75 ppm NAA	3.02	3.52	4.28	4.23	3.29
T_8 - coco peat + 100 ppm NAA	3.22	3.81	4.81	4.23	4.62
T_9 - vermiculite + 75 ppm IBA	2.87	3.12	3.92	4.21	3.92
T_{10} - vermiculite + 100 ppm IBA	2.71	3.24	3.58	3.27	4.02
T_{11} - vermiculite + 75 ppm NAA	2.82	2.98	3.42	3.81	3.28
T_{12} - vermiculite + 100 ppm NAA	2.62	3.02	3.29	3.53	3.18
T_{13} - leaf mould + 75 ppm IBA	2.66	2.76	3.11	2.91	3.67
T_{14} - leaf mould + 100 ppm IBA	2.23	2.79	2.89	2.83	3.32
T_{15} - leaf mould + 75 ppm NAA	2.01	3.01	2.91	3.01	3.29
T_{16} - leaf mould + 100 ppm NAA	2.63	2.41	2.36	2.63	3.11
T_{17} - Control	1.38	1.91	1.91	1.72	1.98
S.Ed	0.13	0.14	0.19	0.17	0.16
CD (P=0.05)	0.27	0.28	0.29	0.33	0.31

Table 3 - Effect of growing media and growth regulator on the rooting and growth of Chrysanthemum cuttings on 45 th day

Growth Regulator	weight of root(g)	weight of shoot(g)	Number of visible root	Root length (cm)	Number of leaves
T_1 - Rice husk + 75 ppm IBA	4.89	5.29	5.49	7.06	7.28
T_2 - Rice husk + 100 ppm IBA	5.03	5.73	5.81	7.21	7.56
T_3 - Rice husk + 75 ppm NAA	4.73	5.34	5.62	7.01	7.03
T_4 - Rice husk + 100 ppm NAA	4.57	5.21	5.12	6.85	7.11
T_5 - coco peat + 75 ppm IBA	4.72	5.02	564	6.32	6.54
T_6 - coco peat + 100 ppm IBA	5.21	6.04	5.92	7.23	7.59
T_7 - coco peat + 75 ppm NAA	4.23	5.04	5.23	6.39	6.91
T_8 - coco peat + 100 ppm NAA	5.03	5.66	5.72	7.04	7.25
T_9 - vermiculite + 75 ppm IBA	4.13	4.92	4.92	6.22	6.78
T_{10} - vermiculite + 100 ppm IBA	4.61	4.58	5.03	5.74	6.29
T_{11} - vermiculite + 75 ppm NAA	4.34	4.32	4.78	5.93	6.83
T_{12} - vermiculite + 100 ppm NAA	3.97	4.86	5.15	5.86	6.35
T_{13} - leaf mould + 75 ppm IBA	3.84	4.91	4.81	5.25	6.92
T_{14} - leaf mould + 100 ppm IBA	3.54	4.26	4.24	5.03	7.26
T_{15} - leaf mould + 75 ppm NAA	3.24	4.16	4.03	4.62	6.21
T_{16} - leaf mould + 100 ppm NAA	311	4.36	4.06	4.81	6.01
T_{17} - Control	2.34	2.72	2.12	2.89	3.16
S.Ed.	0.13	0.15	0.14	0.22	0.23
CD (P=0.05)	0.25	0.31	0.27	0.45	0.47

Fig 2 - Effect of growing media and growth regulator on days taken for bud sprouting of Chrysanthemum cuttings.



CONCLUSION

Form the research work it can be concluded that the treatment applied with (T_6) coco peat + 100 ppm IBA was found to be the best for rooting in chrysanthemum cuttings which produced better rooting as indicated by higher number of visible root, higher root length and number of leaves. Days taken for rooting and bud sprouting were also found very early in the cuttings. Better physical characteristics, aeration and water holding capacity, nutritional status, and presence of micronutrients in coco peat promotes rooting and growth of cuttings. The application of IBA helps the rooting process faster and it induces early shoot growth and produces new bud sprouts.

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