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Effect of propagation media on clonal propagation through rhizome sections in Alstroemeria cv. 'SERENA'

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ABSTRACT : A field experiment was carried out at the Floriculture Research Farm of SKUAST (K), Shalimar, Srinagar to investigate the effect of propagation media on clonal propagation through rhizome sections in alstroemeria cv. SERENA. Experimental treatments comprised of nine growing media *viz*., soil + sand (1 : 1), soil + sand + farm yard manure (FYM) (1 : 1 : 1), soil + sand + FYM (1 : 2 : 1), soil + sand + FYM (1: 1: 2), soil + cocopeat + sand (1 : 1 : 1), soil + sand + cocopeat (1 : 2: 1), soil + sand + cocopeat (1 : 1: 2), sand + FYM (1 : 1) and sand + cocopeat (1: 1) were tested for their influence on shoot and rhizome development. Among the different growing media used, soil + sand + cocopeat (1 : 1 : 2) performed superior recording maximum per cent sprouting (63.42%), per cent established plants (61.76%), number of vegetative shoots at 30, 60, 90, 120 DAP (1.42, 2.67, 3.94, 5.92), weight of the rhizome cluster per plant (14.53 g), number of rhizomes developed (2.96), length of the longest rhizome (6.20 cm), number of new storage roots (6.12), number of new fibrous roots (7.28) and propagation co-efficient (42.07) whereas, media containing sand + cocopeat (1: 1) performed poorly.

KEY WORDS : Growing substrate, Propagation co-efficient, Vegetative growth, Alstroemeria

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Alstroemeria (*Alstroemeria* spp.) belonging to the family Alstroemeriaceae is a bulbous flower crop of high commercial value. It has become an important part of the commercial cut flower trade occupying a position within top 10 cut flowers in international market. The increasing popularity of alstroemeria is due to wide range of flower colors available and its diversified use as a cut flower, potted flowering plant and herbaceous landscape plant. The genus is a rhizomatous monocot and belongs to the Alstroemeriaceae family. With the development of new hybrids, it has attained the status of one of the 10 most important cut flowers in the world. Alstroemerias grow from seeds with ease (King and Bridgen, 1990) although plants are generally multiplied by division of rhizomes. Propagation by seed is generally avoided due to genetic variability and occasional difficulties in seed germination (Bridgen, 1993). The alstroemeria plant consists of sympodial fleshy multistemmed rhizome from which aerial shoots and fibrous roots arises and produces two types of shoots: flowering and vegetative which emerge from underground rhizomes (Hamrick, 2003), which should be planted in loose, well-drained organic media. Alstroemeria is very sensitive to heavy water-logged soil and the rhizomes are highly susceptible to rotting in prolonged wet conditions (Bridgen, 1997). Lisiecka (1981) reported that light and humus substrate is suitable for alstroemeria cultivation. Alstroemeria being a newly introduced crop in the Kashmir valley, no systematic research has been done till date. Therefore, the present investigation was carried out with the objective to standardize a suitable growing media for clonal multiplication of alstroemeria so as to popularize it as a cut flower in the region.

RESEARCH METHODS

The present investigation was carried out during 2007-

08 at the Floriculture Research Farm of SKUAST (K), Shalimar, Srinagar. Nine growing media *viz*., soil + sand (1: 1); soil + sand + FYM (1: 1: 1); soil + sand + FYM (1: 1: 1); soil + sand + FYM (1: 2: 1); soil + cocopeat + sand (1: 1: 1); soil + sand + cocopeat (1: 2: 1); soil + sand + cocopeat (1: 1: 2); sand + FYM (1: 1) and sand + cocopeat (1: 1) were prepared after thoroughly mixing the ingredients at the experimental farm. A uniform dose of 400, 400 and 200 g of N P K m^{-3} was incorporated at the time of media preparation. Cocopeat bricks were procured from the market. Uniform sized rhizome sections of cv. Serena were planted in small polybags filled with different growing media. The experiment was laid out in a Completely Randomized Design (CRD) with 8 polybags/treatment/replication. The experiment was conducted under 35 per cent shade nets. The plants were fertigated with 200 ppm of N at 14-day intervals starting from one month after planting. All other cultural operations were uniform. The data relating to each parameter were statistically analyzed by applying the technique of analysis of variance and significance was tested by the *F*-test (Gomez and Gomez, 1985). The level of significance for the F- and *t*-tests was P = 0.05.

RESEARCH FINDINGS AND DISCUSSION

The effect of propagation media on clonal propagation through rhizome sections in *Alstroemeria* cv. 'Serena' is presented in Table 1. Less number of days to sprout (16.32 days) were recorded with M_4 whereas maximum days to sprout (21.80 days) were recorded with M_9. FYM and cocopeat are very good insulating agents and as such media mixtures containing these constituents have a higher temperature than other mixtures. This higher temperature could be the reason for early sprouting. Moreover, FYM and cocopeat have a high water retention capacity. The continued availability of moisture in the FYM/cocopeat-containing mixture also helped the rhizome sections to sprout earlier by allowing cells at the growing point to expand rapidly. Rexilius (1990) also reported cocopeat as a crop substrate due to its good water holding capacity. Gangadharm and Gopinath (2000) and Gupta *et al*. (2008) also reported earlier sprouting of gladiolus corms in media containing FYM. However, data in Table 1 showed no significant effect of media on per cent sprouting and per cent established plants.

Significant effect of growing media on vegetative shoot production at 30, 60, 90 and 120 days after planting (DAP) was recorded (Fig. 1). At 30 DAP, number of vegetative shoots recorded was highest (1.42) in M_7 followed by 1.28 in M_8 and M_6. This higher number of vegetative shoots at 30 DAP in FYM/cocopeat-containing formulations could be because of the early sprouting which in turn resulted in higher number of vegetative shoots at 30 days after planting. At 60 days after planting highest number of vegetative shoots (2.67) was recorded in M_7 which was at par with M_6 and M_8. Cocopeat-containing media recorded the highest number of vegetative

Table 1 : Effect of propagation media on clonal propagation through rhizome sections in alstroemeria cv. Serena

Growing media	Days to sprout	Per cent sprouting	Per cent established plants	Weight of rhizome cluster per plant (g)	Number of rhizomes developed/ plant	Length of longest rhizome (cm)	Number of new storage roots per plant	Number of fibrous roots per plant	Propagation coefficient
M_1=Soil + sand (1:1)	20.00	65.83 (54.34)*	66.00 (54.35)*	9.53	1.45	4.40	3.99	4.92	16.33
M_2=Soil + sand + FYM (1:1:1)	16.67	68.33 (55.83)*	64.17 (53.26)*	10.23	1.62	4.70	4.95	5.92	21.07
M_3=Soil + sand + FYM (1:2:1)	17.08	74.17 (60.02)*	66.00 (54.34)*	11.08	1.71	5.05	4.67	5.09	20.15
M_4=Soil + sand + FYM (1:1:2)	16.32	68.00 (55.67)*	67.50 (55.34)*	11.39	1.84	4.67	4.75	6.42	18.99
M_5=Soil + coco peat + sand (1:1:1)	17.86	63.50 (52.85)*	67.62 (55.33)*	11.13	1.82	5.57	3.55	5.25	13.67
M_6=Soil + sand + coco peat (1:2:1)	18.50	77.87 (62.32)*	65.17 (53.86)*	13.10	2.26	4.97	5.40	6.00	29.27
M_7=Soil + sand + coco peat (1:1:2)	17.56	79.17 (63.42)*	77.50 (61.76)*	14.53	2.96	6.20	6.12	7.28	42.07
M_8=Sand + FYM (1 : 1)	18.94	78.25 (62.73)*	69.17 (56.37)*	13.94	2.49	5.83	5.73	6.00	33.78
M_9=Sand + coco peat (1 : 1)	21.80	60.83 (51.26)*	68.33 (55.83)*	7.84	1.13	4.00	2.80	4.50	8.85
$LSD_{(0.05)}$	0.98	NS	NS	3.73	0.47	0.59	0.49	1.24	5.35

* Figures in parentheses are the arc sine transformation of per cent values NS=Non-significant

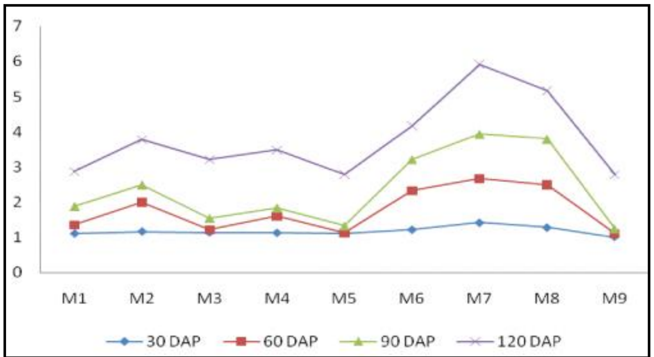

Fig. 1 : Effect of propagation media on the number of vegetative shoots at 30, 60, 90 and 120 DAP in Alstroemeria cv. 'Serena'

shoots. This could be because of the higher CEC of cocopeat that made the applied nitrogen available to plants. At 90 days after planting again cocopeat-based media resulted in significantly better growth with significantly more number of vegetative shoots (3.94) recorded in M_7. FYM-based media fared slightly poorly. This could be because of the tendency of FYM based media to shrink over time, resulting in lowering the volume of growing media and hence, poor growth. Significantly fewer vegetative shoots (1.25) were recorded with M_9 at 90 DAP. Sand, when used alone as growing media, showed the worst response and produce unsatisfactory results for all the growth parameters in *Dahlia* (Kiran *et al*., 2007).

A similar trend was observed at 120 DAP with cocopeat-based media responding better in terms of vegetative growth. At 120 DAP, M_7 recorded significantly more vegetative shoots (5.92) than M_9, which resulted in fewer (2.78) vegetative shoots. Cocopeat prevents the loss of water from rhizomes, resulting in heavier weight of rhizomes due to more food reserves which helped in maximizing the vegetative growth of the plants.

Hence, to sum up, the effect of media on vegetative shoot production reveals the importance of soil in media mixtures. Soil is important to maintain the structure of the growing media as well as a binding agent which allows sand and organic matter to work efficiently. The results are in conformity with the findings of Miller and Langhans (1990) in lily. Bhatia *et al*. (2004) reported that cocopeat-amended media gave maximum plant height and number of shoots/plant. The results are further supported by the findings reported by Baevre (1986). Bridgen and Soriano (1986) also reported improved stem production in 1: 1: 1 soil: peatmoss: perlite media in *Alstroemeria*.

Media containing an organic component resulted in heavier rhizomes except those grown in M_9. The reason for the later could be the absence of soil which lends cohesive quality to the media. Highest rhizome cluster weight (14.53 g) was recorded with M_7, which was at par with the weight recorded in rhizome clusters recovered from M_3, M_4, M_6, and M_8. However, rhizome cluster weight in M_7 was significantly more than the weight of rhizome clusters recovered from M_1, M_2 and M_9. This could also be because of superior growing media conditions in terms of water and nutrient availability in media with organic components. The growing media due to their physico-chemical properties enhanced the formation of fleshy storage roots which accumulated more nutrients and water and ultimately increased the weight of the rhizome cluster. These findings are in accordance with Gupta and Gupta (2007) in *Alstroemeria*.

The number of new rhizomes developed/plant exhibited a similar trend. Again, cocopeat-based formulation M_7 resulted in significantly more rhizomes (2.96) followed by FYM-based formulation (M_8). Plants in M_9 without any organic component developed fewest rhizomes/plant (1.13). The number of rhizomes formed depends upon the time of initiation of branching. Media with organic base allow a head start for new above ground growth which in turn provides photosynthates for underground organs. This early initiation of new rhizome allows more time for branching and hence, more number of rhizomes at the harvest. These results are supported by John *et al*. (1997) in gladiolus who also reported more number of corms with FYM as the media component.

The length of the longest rhizome was significantly affected by growing media. Longest rhizomes (6.2 cm) were recorded in M_7 and shortest rhizomes (4 cm) in M_9. A favourable environment for underground storage organs in a FYM/cocopeat-based mixture allows unhindered extension of the new rhizomes. This is because of the low bulk density of the organic matter mixtures which keeps the medium light and porous for rhizome development. Rani *et al*. (2005) reported larger and heavier *Lilium* bulbs due to the property of cocopeat to assimilate more food reserves which increased the size and ultimately the weight of bulblets.

Most new storage roots (6.12) and fibrous roots (7.28) were recorded in M_7 followed by M_8 and M_6. The fewest storage roots (2.80) and fibrous roots (4.50) were recorded in M_9. A well drained and aerated growing medium encourages root formation than a wet one. Organic components in media are responsible for the aforementioned attributes which might be the reason behind development of good root system. Singh *et al*. (2002) reported that media containing cocopeat results in longest carnation cutting roots.

A significantly propagation co-efficient (42.07) was recorded in media containing cocopeat as one of the constituent *viz*., M_7 followed by FYM-based M_8. Propagation co-efficient was calculated as the number of rhizomes harvested per rhizome planted with the weight of the rhizome also factored in. The improved propagation co-efficient could be because of the overall positive effect of the optimal conditions in the organic growing media on such parameters as weight of the rhizome cluster, number of rhizomes, length as well as new storage roots. Lisiecka and Szczepaniak (1992) reported that the propagation co-efficient was positively correlated with the weight of the rhizome in *Alstroemeria*.

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