Himachal Journal of Agricultural Research 40(1):34-38 (2014)

Production of elite planting material of strawberry using soil-less substrates under protected condition

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Manuscript Received: 07.10.2013; Accepted: 19.06.2014

Abstract

Strawberry has a great potential for becoming a remunerative crop in Himachal Pradesh, but the problem lies in the non-availability of good and healthy planting material. Soil borne diseases caused by *Verticillium* and *Phytophthora*, result in severe production losses in strawberry culture which can be avoided by using soilless substrates. Moreover, strawberry also has a very high phosphorus demand which can be met with the help of Arbuscular Mycorrhizal fungi (AM). However, research on its profitability in strawberry production under protected condition needs to be carried out before any conclusion can be derived. Hence, efforts are being made to produce elite planting material (runners) under protected condition using different soilless substrates enriched with AM fungi. Strawberry runners were grown successfully on perlite as well as on cocopeat mixes in a polyhouse having irrigation facilities. Perlite and perlite combinations resulted in increased runner production with better growth parameters.

Key words: Strawberry, runners, cocopeat, perlite, Arbuscular mycorrhizal fungi.

Introduction

Strawberry, one of the most widely consumed fruits throughout the world, is mostly grown under protective structures. In India, such a system of strawberry cultivation is becoming quite popular, particularly in the Western and Southern parts of the country. In Himachal Pradesh, its cultivation under controlled environment is slowly gaining momentum as the crop can be picked as early as December after planting in September thus fetching a better price. Further, with the introduction of day neutral cultivars and choice of appropriate environment, it can be made available as fresh fruit throughout the year rather than being a traditional seasonal crop. But the problem lies in the non-availability of good and healthy planting material. Further soil borne diseases can cause severe production losses in Strawberry culture. Generally an ideal rooting media combination can provide sufficient porosity, aeration and water holding capacity (Hartmann *et al.*, 2007). Soilless media combinations in particular can also reduce the soil borne diseases. Strawberry also has a very high phosphorus demand, which may not be within the capacity of the root system to provide during the reproductive phase of the crop. Arbuscular Mycorrhizal fungi (AM) can supply this phosphorus requirement as such resulting in enhanced growth parameters (Paraskevopoulou-Paroussi *et al.,* 1997). However, research on the profitability of soilless

cultures enriched with AM fungi along with fertigation in strawberry production under protected condition needs to be carried out before any conclusion can be derived. Keeping this in view, it was thought worthwhile to conduct investigation to standardise the growing conditions using different substrates, to determine the medium best suited for producing elite planting material (runners) under polyhouse conditions and to supply the elite planting material (runners) obtained from these polyhouse grown plants to the growers for raising disease free plants.

Materials and Methods

The experiment was carried out during 2005 and 2006 at the Department of Soil Science and Water Management, Dr. Y.S. Parmar, University of Horticulture and Forestry, Nauni, Solan, Himachal Pradesh. A polyhouse having side and top ventilation and equipped with sprinkler and drip irrigation system and shade screens was used. Elite plants of strawberry cv. Chandler selected from an established mother block were planted for multiplication within a polyhouse in 1x2 m beds filled with different substrates at a distance of 25x50 cm in the first week of November, 2005. When the plants established the substrates were enriched with the application of VAM culture in March for the enhancement of runner production. Typically, irrigation was applied on an average at 1-2 days interval through micro sprinkler irrigation using lighter rates to maintain appropriate upper soil moisture while fertilizers was applied through drip irrigation system using soluble fertilizers and applied in ten split doses. Plot beds were weeded twice during the season. Measurements related to stand and vigor of the plants and number of daughter runners were made prior to harvest. Only those daughter runners which were rooted and considered to be commercially acceptable plants for sale were considered for supplying to the growers. The experiment was laid out in a Completely Randomized Block Design using the following treatments:

T_1 : Perlite

T_2 : Cocopeat

T_3 : Perlite + Cocopeat (2:1)

T_4 : Cocopeat + Perlite (2:1)

T_5 : Perlite fertilized with FYM

T_6 : Cocopeat fertilized with FYM

Replications: 4

Results and Discussion

The growing substrates influenced the growth and runner production positively and significantly. Perlite and perlite combinations resulted in runner production with better growth parameters. Lee *et al.* (1999); Yang *et al.* (1999) and Traka-Mavrona *et al.* (2001) also observed better growth promotion with the use of perlite-based substrate mixtures.

A perusal of data presented in Table 1 revealed that, maximum plant height, number of leaves and leaf area was recorded when perlite alone was used as a growing substrate though they were statistically at par with perlite + cocopeat (2:1) presumably due to better water holding capacity and nutrient availability thus promoting better vegetative growth (Beardsell *et al.*, 1979; Anagnostou and Vasilakakis, 1995; Chhukit, 2009). Perlite alone has also been reported by other workers (Hall *et al.,* 1988) to have excellent performance when used as a substrate in hydroponic culture, probably resulting in a high rate of water uptake by the crop, efficient water use and topped by the economy of reusing the substrate for more than one growing cycle as against the findings of Traka-Mavrona *et al.* (2001) who reported better growth performances only when perlite-based mixtures and cocopeat alone is used. Similarly the maximum number of runners developed, number of roots and root length (Table 2) was observed under perlite though the observations for runner development were at par with most of the

treatments. Similar results of maximum number of runner production, root length and number of strawberry plantlets per runner were observed by Joshi (2003), which was attributed to better aeration and good nutrient supply leading to more runner production and subsequently more plantlets per runner in perlite combinations. The growing substrates did not significantly affect leaf P unlike that of N and K where, the maximum was recorded under perlite treatment (Table 3). The use of AM fungi may have also influenced the growth and nutrient uptake as also reported by Silva and Patterson (1996) and Oliviera *et al.* (2003).

Table 1 Effect of soil substrates on plant growth

Treatments	Plant height (cm)		Av. no. of leaves		Leaf area (cm^2)	
	2006	2007	2006	2007	2006	2007
T_1	30.10	34.42	34.06	38.12	137.80	140.32
T_2	28.03	32.00	30.18	35.28	125.23	131.45
T_3	29.86	33.98	33.71	37.35	135.16	138.56
T_4	28.14	32.09	33.41	37.16	134.40	135.39
T_5	28.33	32.46	33.67	37.16	125.32	131.87
T_6	27.55	31.24	29.89	34.97	114.36	129.89
T_7	25.62	29.93	28.77	34.20	111.89	127.00
CD (P=0.05)	0.84	1.01	0.68	0.65	5.13	2.79

Table 2 Effect of soil substrates on runner growth and production

Treatments	Av. no. of runners/plant		Av. no. of roots		Av. root length (cm)	
	2006	2007	2006	2007	2006	2007
T_1	45.27	56.98	48.91	51.09	18.51	18.92
T_2	43.78	52.96	47.67	49.93	16.48	16.73
T_3	45.05	54.87	48.30	50.72	17.92	18.16
T_4	44.69	54.65	48.16	49.47	16.86	17.08
T_5	44.72	53.33	47.89	50.24	17.33	17.87
T_6	43.56	53.12	47.44	48.98	16.27	16.53
T_7	40.32	49.41	45.22	46.14	13.55	14.26
CD (P=0.05)	1.29	1.87	0.98	1.75	0.77	1.34

Table 3. Effect of soil substrates on leaf nutrients

Treatments	Leaf N (%)		Leaf P (%)		Leaf K (%)	
	2006	2007	2006	2007	2006	2007
T_1	2.25	2.28	0.22	0.22	1.38	1.32
T_2	2.11	2.14	0.20	0.20	1.15	1.17
T_3	2.18	2.22	0.21	0.21	1.25	1.28
T_4	2.14	2.15	0.21	0.21	1.16	1.20
T_5	2.08	2.10	0.20	0.22	1.19	1.21
T_6	2.04	2.07	0.20	0.21	1.12	1.16
T_7	1.79	1.86	0.20	0.20	1.04	1.07
CD (P=0.05)	0.20	0.24	NS	NS	0.07	0.10

Based on the present study, Perlite and perlite + cocopeat (2:1) were found to be the best substrates for strawberry runner production in polyhouse condition under the mid hill zone of Himachal Pradesh in combination with irrigation through micro sprinklers, soluble fertilization through drip irrigation and Mycorrhizal inoculation.

Acknowledgement

These research findings are a part of the adhoc research scheme supported financially under "Technology Mission for Integrated Development of Horticulture in Himachal Pradesh"

References

Anagnostou K and Vasilakakis MD 1995. Effect of substrate and cultivar on earliness, plant productivity and fruit quality of strawberry. Acta Hort. **379**:267-74.

Beardsell VD, GD Nichols and Jones LD 1979. Physical properties of nursery potting-mixtures. Sci. Hort. 11: 1-8.

Chhukit Kalzang 2009. Studies on vegetative propagation of Kiwifruit (*Actinidia deliciosa).* M Sc Thesis, Department of Fruit Science, Dr Y S Parmar University of Horticulture and Forestry, Solan, HP (unpublished).

Hall DA, Hitchon GM and Szmidt RAK 1988. Perlite culture: A new development in hydroponics. ISOSC Proceedings.

Hartmann HT, Kester DE, Davies FT and Geneva RL 2007. *Plant Propagation: Principles and Practices*. Prentice Hall of India. New Delhi.

Joshi PS 2003. Effect of growing media, bioregulators and nutrients on growth, yield and quality of strawberry cv. Chandler. Ph D Thesis. Department of Fruit Science, Dr Y S Parmar University of Horticulture and Forestry, Solan, HP (unpublished).

Lee J, Lee R, Son Jang F, Kim K, Lee Y and Kim S 1999. Water retentivity and several vegetable seedling growth in decomposed rice hull substrates with different particle sizes. J. Korean Soc. Hort Sci. **41** (3): 245-48.

Olieviera AN, Oliviera LA, Figueiredo AF and Oliviera AN 2003. Arbuscular mycorrhizal colonization and

nutrient concentration of 3 cultivars of banana on Central Amazonean Ohisol. Acta Amazonica **33** (3): 345-52.

Paraskevopoulou-Paroussi, Karagiannidis N, Paroussis E and Spanomitsios G 1997. The effect of mycorrhiza on nutrient uptake and plant development of three strawberry cultivars. Acta Hort. **439**: 709-15.

Silva de A and Patterson K 1996. Endomycorrhizae and growth of Sweet Heart strawberry seedlings. Hort. Sci. **31** (6): 951-54.

Traka-Mavrona E, Gerasopoulos D, Pritsa T and Maloupal E 2001. Growth, fruit yield and quality of tomato in relation to substrate and nutrient source in a soilless culture system. Acta Hort. **548**: 173-79.

Yang S, Choi K, Kin W, Kin S, Yang S, Choi K, Kim W and Kim S 1999. Effect of culture media on rooting and root growth of lateral shoots of cuttings in cherry tomato. J. Korean Soc. Hort Sci. **40** (3): 294-96.