

Effect of media and nutrition on growth, yield and quality of *Asparagus densiflorus* 'sprengerii' L.

P. SOWMIYA AND P. KARUPPAIAH

Department of Horticulture (Floriculture and Landscape Architecture), Faculty of Agriculture, Annamalai University, Tamil Nadu, India

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ABSTRACT

A study was conducted during the year 20019-2020 at Annamalai University, Annamalainagar to find out a suitable media and appropriate nutrition to increase the growth, yield and quality of *Asparagus densiflorus* 'sprengerii' L. as cut foliage. The experiment was laid out in randomized block design with 8 treatments and 3 replications. Among the different treatments, the treatment T₉ (2 parts of garden soil + 1 part of farmyard manure, decomposed coirpith and pressmud + 19:19:19 NPK complex fertilizer @ 1.5 % spray) was found to be the best in respect of all growth, yield and quality attributes such as foliage stalk length (58.6cm), primary branches per foliage stalk (48.8), length of primary branches in foliage stalk (11.2cm cladophylls per foliage stalk (1212.2), plant spread – East -West (79.4cm²), plant spread – North - South (58.4cm²), chlorophyll content (0.326 mg g⁻¹), fresh weight of foliage stalk per plant (159.3g), dry weight of foliage stalk per plant (20.0g), fresh weight of roots and tubers per plant (278.6g), dry weight of roots and tubers per plant (57.3g), dry matter production (109.5g), tubers per plant (68.0), foliage stalks per plant (36.5), visual scoring (9.3), vase life of foliage stalk without pulsing (9.0 days) and with pulsing (13.2 days), followed by T₇ (2 parts of garden soil + 1 part of farmyard manure and pressmud + 19:19:19 NPK complex fertilizer @ 1.5 % spray). Control recorded the minimum growth, yield and quality attributes of asparagus.

Key words: Asparagus, cut foliage, media, nutrition.

INTRODUCTION

Cut foliage is the vegetation used in large quantities as a source of decoration on its own or on association with flowers in bouquets. This trend is set to increase further because of the green healthy image presented by such products and predicted increase in consumption of floral products. Cut foliage is used as a filler, lining and background material in various flower arrangements. They are also used for bringing life to the bouquets, wreaths and garlands, which would otherwise look dull. In recent decades, there has been increasing interest in floriculture and its products with great potential in the domestic as well as in export market. The major problems of production in tropics are the poor quality of the *Asparagus* compound to that grown in temperate climate. There is a very little reliable information available on how best to grow *Asparagus* in the tropics. In recent years, it has been realized that higher yield and quality of crop plants can be obtained by application of inorganic nutrients through foliar spray combined with the application of organics like FYM, decomposed coirpith (DCC), and pressmud (PM) as soil amendment. FYM plays a vital role in any

crop growth and maintenance of soil health. The FYM seems to act directly by increasing crop growth and yield either by acceleration of respiratory process or by cell permeability or by hormonal growth action. Decomposed coirpith and pressmud are rich in all essential plant nutrients. They improve media structure, texture, aeration, and water holding capacity and are rich in beneficial micro flora such as nutrients fixers, P- solubilizers, cellulose decomposing micro-flora etc, in addition to improve soil environment. They prevent nutrient losses and increase the use efficiency of chemical fertilizers. (Ahmad *et al.*, 2020). NPK fertilizers are water soluble, taken up by the plant almost immediately and provide the nutrients to plant needs for healthy growth. Foliar application seems to be promising for ensuring use efficiency of applied nutrients. Foliar spray enables plants to absorb the applied nutrients from the solution through their leaf surface and thus, may result in the economic use of fertilizer. Nutrition of the growing media influences the growth and nutrient uptake by plants. Ideal growing media and appropriate nutrition have proven their ability on production of good quality floriculture produces especially cut flowers and foliage. With this in view, the

present study was concluded to study the effect of media and nutrition on growth, yield and quality of *Asparagus densiflorus sprengeri* L.

MATERIALS AND METHODS

The study was carried out at Annamalai University, Annamalai Nagar; Tamilnadu during 2019-2020. The experiment was laid out in randomized block design with 8 treatments and 3 replications. The treatments were: T₁ (3 Parts of garden soil + water spray) as control, T₂ (3 Parts of garden soil + 19:19:19 NPK complex fertilizer @ 1.5% spray), T₃ (2 Parts of garden soil + 1 part of FYM + 19:19:19 NPK complex fertilizer @ 1.5% spray), T₄ (2 Parts of garden soil + 1 part of pressmud + 19:19:19 NPK complex fertilizer @ 1.5% spray), T₅ (2 Parts of garden soil + 1 Part of decomposed coirpith + 19:19:19 NPK complex fertilizer @ 1.5% spray), T₆ (2 Parts of garden soil + 1 Part of FYM and decomposed coirpith + 19:19:19 NPK complex fertilizer @ 1.5% spray), T₇ (2 Parts of garden soil + 1 Part of FYM and pressmud + 19:19:19 NPK complex fertilizer @ 1.5% spray), T₈ (2 Parts of garden soil + 1 Part of decomposed coirpith and pressmud + 19:19:19 NPK complex fertilizer @ 1.5% spray) and T₉ (2 Parts of garden soil + 1 Part of FYM, decomposed coirpith and pressmud + 19:19:19 NPK complex fertilizer @ 1.5% spray). The raised beds were formed in uniform size (500cm x 90 cm x 45 cm) by the mixture of garden soil, FYM, pressmud and decomposed coirpith on volume basis as per the treatment schedule. Water soluble fertilizer mixture of 19:19:19 NPK was sprayed at a concentration of 15 g l⁻¹ (1.5% spray solution) at an interval of once in a fortnight. The spacing between two plants was 45cm x 45cm. A spacing of 30 cm was maintained between beds. The planting pattern was triangular. The well maintained, uniform size seedlings having 3 – 4 foliage stalk per plant were transplanted. Life irrigation was given immediately and two subsequent irrigations were given at two days interval through rose can. Subsequent irrigations were done as per the requirements. Uniform culture practices were maintained for all the treatments. The biometric observations on growth and physiological parameters like foliage stalk length, primary branches per foliage stalk, length of primary branches in foliage stalk, cladophylls per foliage stalk, plant spread, chlorophyll content, fresh weight of foliage stalks per plant, dry weight of foliage stalks per plant,

fresh weight of roots and tubers per plant, dry weight of roots and tubers per plant, dry matter production per plant, number of tubers per plant, yield and quality parameters such as number of foliage stalks per plant, visual scoring and vase life of foliage stalks with and without pulsing were observed at 270 days after planting. The visual scoring of the cut foliage was recorded as per the Hedonic sensory evaluation method. Vase life without pulsing (days) and vase life with pulsing (days) of the cut foliage in each treatment replications were noted under room temperature. Third foliage stalk from the top was used to measure the biometric observations. The data on various parameters were analysed statistically as per the procedure suggested by Panse and Sukhatme (1997).

RESULTS AND DISCUSSION

Growth and physiological parameters

The data indicated that there was a significant difference on growth of asparagus due to different treatments (Table 1). Among the growth attributes, foliage stalk length, number of primary branches per foliage stalk, length of primary branches in foliage stalk and number of cladophylls per foliage stalk were observed to be the maximum in T₉ (2 Parts of garden soil + 1 Part of FYM, decomposed coirpith and pressmud + 19:19:19 NPK complex fertilizer @ 1.5% spray) with the values of 58.6 cm, 48.8, 11.2 cm and 1212.2 respectively, followed by T₇ (2 Parts of garden soil + 1 Part of FYM and pressmud + 19:19:19 NPK complex fertilizer @ 1.5% spray) with the values of 56.8 cm, 47.4, 10.7 cm and 1175.1 respectively. The minimum values on foliage stalk length (33.4 cm), number of primary branches per foliage stalk (29.1), length of primary branches in foliage stalk (4.6 cm) and number of cladophylls per foliage stalk (662.3) were recorded in control. The increase in growth attributes over the control might be due to the combined application of FYM, decomposed coirpith and pressmud which facilitated good aeration, adequate drainage and make a favourable soil environment for deep penetration of roots and higher nutrient extraction from the rhizosphere. Concomitant observations were made by Swetha *et al.* (2014) in *aglaonema*, Kavana *et al.* (2019) in *Nephrolepis fern* and Kumar *et al.* (2019) in *anthurium*.

Table 1: Effect of growing media and nutrition on growth parameters in *Asparagus densiflorus*'sprengerii' L at 270 days after planting

Treatments	Foliage stalk length (cm)	Primary branches/ foliage stalk	Length of primary branches (cm)	Cladophylls/ foliage stalk	Plant spread (East-West) (cm ²)	Plant spread (North-South) (cm ²)
T ₁	33.4	29.1	4.6	662.3	41.8	41.1
T ₂	47.9	40.6	8.4	966.1	63.3	48.1
T ₃	54.1	45.4	10.0	1118.2	72.7	51.1
T ₄	49.7	41.9	8.8	1004.0	66.0	48.9
T ₅	51.5	42.3	9.3	1042.1	68.7	49.6
T ₆	55.9	46.8	10.5	1156.1	75.4	51.9
T ₇	56.8	47.4	10.7	1175.1	76.8	52.6
T ₈	53.3	44.7	9.8	1080.1	71.3	53.4
T ₉	58.6	48.8	11.2	1212.2	79.4	58.4
S.Ed	0.91	0.74	0.24	19.06	1.36	0.57
CD (P=0.05)	1.83	1.49	0.49	38.12	2.73	1.15

The plants irrespective of their treatments had more spread on East-West direction than the North-South direction which may be due to sunlight availability and solar movement in the tropics especially in the coastal ecosystem. Among the treatments, T₉ (2 Parts of garden soil + 1 Part of FYM, decomposed coirpith and pressmud + 19:19:19 NPK complex fertilizer @ 1.5% spray) recorded the maximum plant spread on both the direction with the values of 79.4 cm² (East-West) and 58.4 cm² (North-South) than the other treatments. The minimum values of plant spread were 41.8 cm² (East-West) and 41.1 cm² (North-South) (Table.1). The chlorophyll content of *Asparagus* had a significant variation with grow the media and nutrition. The maximum content of chlorophyll (0.32 mg g⁻¹) was registered in the treatment with 2 Parts of garden soil + 1 Part of FYM, decomposed coirpith and pressmud + 19:19:19 NPK complex fertilizer @ 1.5% spray (T₉), followed by 2 Parts of garden soil + 1 Part of FYM and pressmud + 19:19:19 NPK complex fertilizer @ 1.5% spray (T₇) with the value of 0.31 mg g⁻¹. The minimum chlorophyll content (0.24 mg g⁻¹) was recorded in control. It may be due to the fact that easy availability of macro and micro nutrients from the grow the media and the maximum uptake of nutrients through plant root system and foliar spray. These results are in conformity with the findings of Karuppaiah *et al.* (2006) in French marigold and Kumar *et al.* (2019) in anthurium.

The treatment T₉ (2 Parts of garden soil + 1 Part of FYM, decomposed coirpith and pressmud + 19:19:19 NPK complex fertilizer @ 1.5% spray) was found to be the best in respect

of fresh and dry weight of foliage stalks per plant (159.3 g and 20.0 g), fresh and dry weight of roots and tubers per plant (278.6 g and 57.3 g) and dry matter production of *Asparagus* (109.5 g), followed by T₇ (2 Parts of garden soil + 1 Part of FYM and pressmud + 19:19:19 NPK complex fertilizer @ 1.5% spray). The minimum values of these attributes were recorded in control (95.5 g and 10.8 g, 126.9 g and 24.7 g and 63.5 g respectively). This can be attributed to the fact that the right combination of FYM, decomposed coirpith and pressmud improved the physico-chemical and biological properties, porosity, water holding capacity, permeability and nutrient status which are collectively facilitated the plants to grow well both in the soil and in turn lead to the higher biomass production of *Asparagus*. This was also noticed by Sankari *et al.* (2019) in asparagus. As roots and tubers are in direct contact with growth media and any changes in their surrounding environment can possibly affect its growth. The growing media with FYM, decomposed coirpith and pressmud provides better soil texture, structure, aeration, moisture, provision of nutrients and balance between solid particles and pore spaces. These leads to the healthy growth of shoots, roots, storage of foods in the tubers that ultimately resulted in maximum fresh and dry weight of foliage stalks per plant and also fresh and dry weight of roots and tubers per plant. These results are in line with the findings of Hussain *et al.* (2017) in caladium. The treatment T₉ (2 Parts of garden soil + 1 Part of FYM, decomposed coirpith and pressmud + 19:19:19 NPK complex fertilizer @ 1.5% spray)

gave the maximum number of tubers per plant with the value of 68.05 followed by T₇ (2 Parts of garden soil + 1 Part of FYM and pressmud + 19:19:19 NPK complex fertilizer @ 1.5% spray) with the value of 65.65. The maximum number of tubers may be due to the foliar spray of nitrogen, phosphorus, potassium and also the effect of nitrogen in providing better growth and

development of plant and it helps in translocation of photosynthates from source (leaves) to sink (tubers) by source sink action. The ideal combination of the media and its physico-chemical properties might also facilitate the production of more number of tubers per plant. The present findings are in agreement with the findings of Sankari *et al.* (2019) in asparagus.

Table 2: Effect of growing media and nutrition on growth and physiological parameters in *Asparagus densiflorus'sprengeri'* L at 270 days after planting

Treatments	Chlorophyll content (mg g ⁻¹)	Fresh weight of foliage stalks/plant (g)	Dry weight of foliage stalks/plant (g)	Fresh weight of roots and tubers/plant (g)	Dry weight of roots and tubers/plant (g)	Dry matter production (g)	Tubers per plant
T ₁	0.241	95.5	10.8	126.9	24.7	63.5	25.8
T ₂	0.289	138.9	17.3	239.2	38.3	94.7	48.6
T ₃	0.310	151.1	17.6	258.3	46.7	100.3	59.9
T ₄	0.295	141.9	18.1	237.0	65.0	96.1	51.4
T ₅	0.301	145.0	18.4	244.7	48.7	97.5	54.2
T ₆	0.316	153.1	18.8	265.1	52.8	101.6	62.8
T ₇	0.319	157.7	19.1	273.9	55.5	103.1	65.6
T ₈	0.307	148.0	18.6	251.5	50.1	98.9	57.1
T ₉	0.326	159.3	20.0	278.6	57.3	109.5	68.0
S.Ed	0.003	1.45	0.20	3.45	0.92	0.69	1.43
CD (P=0.05)	0.006	2.91	0.41	6.91	1.84	1.39	2.86

Yield and quality parameters

The treatment T₉ (2 Parts of garden soil + 1 Part of FYM, decomposed coirpith and pressmud + 19:19:19 NPK complex fertilizer @ 1.5% spray) recorded the maximum (36.5) number of foliage stalks per plant followed by T₇ (2 Parts of garden soil + 1 Part of FYM and pressmud + 19:19:19 NPK complex fertilizer @ 1.5% spray) with the value of 35.1. The minimum value of 16.5 was recorded in the control (Table

3). The increase in number of foliage stalk may be due to the reduced soil moisture loss, increased soil physico-chemical and biological properties, increased soil organic matter and nutrient content in the best treatment which indirectly improved vigorous plant and ultimately lead to more number of good quality foliage stalks per plant. The results are in line with the findings of Kavana *et al.* (2019) in *Nephrolepisfern*.

Table 3: Effect of growing media and nutrition on yield and quality parameters in *Asparagus densiflorus'sprengeri'* L

Treatments	Foliage stalks/plant	Visual scoring	Vase life (days)	
			Without pulsing	With pulsing
T ₁	16.5	6.15	3.78	6.63
T ₂	28.0	8.21	7.13	10.81
T ₃	33.0	8.61	8.31	12.27
T ₄	29.4	8.18	7.44	11.19
T ₅	30.8	8.45	7.74	11.56
T ₆	34.4	8.98	8.45	12.46
T ₇	35.1	9.16	8.76	12.85
T ₈	32.3	8.52	8.03	11.92
T ₉	36.5	9.38	9.05	13.25
S.Ed	0.73	0.16	0.15	0.20
CD (P=0.05)	1.47	0.22	0.31	0.41

In view of quality aspects as visual scoring and vase life of foliage stalk both under with and without pulsing, the treatment T₉ (2 Parts of garden soil + 1 Part of FYM, decomposed coirpith and pressmud + 19:19:19 NPK complex fertilizer @ 1.5% spray) was found to be the excellent treatment combination with the values of 9.3, 13.2 and 9.0 days, followed by T₇ (2 Parts of garden soil + 1 Part of FYM and pressmud + 19:19:19 NPK complex fertilizer @ 1.5% spray) with the values of 9.1, 12.8 days and 8.7 days, respectively than the control (6.1, 6.6 days and 3.7 days respectively) (Table.3). The increase in quality aspects might be due to higher carbohydrate and other essential nutrients deposition in vegetative cells, which resulted in thickening of cells and production of good quality and attractive foliage. The thickened and good quality cells were useful to

suppress the ethylene and abscisic acid to prolong the vase life and appearance of cut foliage. Also, the stimulatory effects of foliar application of NPK might have resulted in greater accumulation of assimilates which leads to stronger cut stems. Similar findings were given by Sandeep *et al.*, (2018) in *Nephrolepis fern* and Kayalvizhi *et al.*, (2013) in *Asparagus densiflorus* 'Meyersii'.

From the results, it may be concluded that the treatment T₉ (2 Parts of garden soil + 1 Part of FYM, decomposed coirpith and pressmud + 19:19:19 NPK complex fertilizer @ 1.5% spray) was found to be significantly beneficial with respect to growth, physiological, yield and quality parameters of *Asparagus* cut foliage and for the effective cultivation under open field cultivation in the coastal ecosystem.

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