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Influence of fertilization modules on economics and profitability of rooted carnation (*Dianthus caryophyllus*) cutting production

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ABSTRACT

An experiment was conducted to evaluate the economics and profitability of rooted carnation (*Dianthus caryophyllus* L.) cutting production influenced by fertilizer modules. Four commercial carnation cultivars, viz. White Wedding, Farida, Niva, Madras and five fertilizer modules were undertaken for investigation at the Department of Floriculture and Landscaping, Dr Y S Parmar University of Horticulture and Forestry, Nauni, Solan. Maximum net returns and benefit cost ratio was obtained from cultivar Niva (₹ 12 34 091.20 and 8.55:1) followed by Farida (₹ 11 40 851.20 and 7.90:1) and Madras (₹ 11 35 811.20 and 7.87:1) with fertilizer module comprising of 20-5-5 g/m^2 NPK as basal dose and 200 ppm N + 280 ppm K as fertigation twice a week (FM_5), while, lowest was associated with cultivar White Wedding. The cultivar White Wedding showed maximum net returns (₹ 10 95 435.43) and benefit cost ratio (7.59:1) with fertilizer module FM_4 composed of 20-15-10 g/m^2 NPK as basal dose and 175 ppm N + 245 ppm K as fertigation twice a week. However, the minimum benefit cost ratio was noticed in the cultivars White Wedding (5.86:1), Farida (5.46:1) and Madras (6.26:1), respectively, from fertilizer module FM_1 comprised of basal fertilizer dose of 20-20-10 g/m^2 NPK and fertigation with 100 ppm N + 140 ppm K twice a week except the cultivar Niva (5.33:1) where fertilizer module FM_2 composed of 20-15-5 g/m^2 NPK as basal dose along with 125 ppm N + 175 ppm K given as fertigation twice a week was predominant. Thus, farmer can get average net income ranges ₹ 7 68 206.57 with fertilizer module FM_2 to ₹ 12 34 091.20 with fertilizer module FM_5 in cultivar Niva from 500 meter square area. Further, this fertilization module may be undertaken to produce the desired quantity of rooted carnation cuttings to meet the demand and to get the maximum returns.

Key words: Benefit cost ratio, Carnation, Cuttings

Floriculture is a lucrative profession with higher potential for returns than most of the field and other horticultural crops. Owing to rapid urbanization and better standards of living, the demand for flowers is on the rise both in India and international markets.

Consequently, floriculture industry has been experiencing rapid growth necessitating the increasing demand for floriculture items, which need to be capitalized for the benefit of the farming community (Mishra 2007). The leading flowers which are in great demand are rose, chrysanthemum, carnation, gladiolus and anthurium. Carnation (*Dianthus caryophyllus* L.) is among the most valued cut flower in the international as well as the domestic market and commands a respectable price both for its cut flower and propagating material. In India, the carnation flower industry is still in infancy stage and its cultivation is concentrated in some pockets of the country like Himachal Pradesh, Pune, Bangalore and some parts of North-Eastern states. In Himachal Pradesh, carnation is now being commercially grown in districts of Solan, Shimla, Mandi, Kullu, Chamba and Bilaspur.

Carnation is commercially propagated through shoot-tip cuttings. Production of healthy plants is important where the planting stock is maintained for about some months (Thakur 1993). As far as the productivity is concerned, there is a lot of scope for increasing the productivity and profit through adoption of the latest improved production and marketing technologies. Benefit cost ratio is an important and ultimate factor which decides the optimum levels of input to be used for maximization of production and returns from any crop. Since, the production of planting material of carnation is an upcoming business opportunity especially in India, it is essential to work out the economics. Notwithstanding the benefits and potential of floriculture

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and propagation of carnations in particular in the potential areas, little research has been conducted to assess its profitability. Therefore, a study was very much required to understand the economics of rooted carnation cutting production which will be useful to cut flower growers, extension workers, scientists, administrators and planners.

MATERIALS AND METHODS

The present investigation was carried out at the experimental farm of Department of Floriculture and Landscaping, Dr Yashwant Singh Parmar University of Horticulture and Forestry, Nauni, Solan during 2010-11 and 2011-012. The experimental farm is located 1276 m above mean sea level at the latitude of 32°512 02 2 N and longitude of 77°112 302 2 E. Four cut flower cultivars of carnation, viz. White Wedding (V_1), Farida (V_2), Niva (V_3), Madras (V_4) and five fertilization modules such as 20-20-10 g/m^2 NPK (basal) + 100 ppm N + 140 ppm K as fertigation twice a week (FM_1), 20-15-5 g/m^2 NPK (basal) + 125 ppm N + 175 ppm K as fertigation twice a week (FM_2), 20-10-5 g/m^2 NPK (basal) + 150 ppm N + 210 ppm K as fertigation twice a week (FM_3), 20-15-10 g/m^2 NPK (basal) + 175 ppm N + 245 ppm K as fertigation twice a week (FM_4) and 20-5-5 g/m^2 NPK (basal) + 200 ppm N + 280 ppm K as fertigation twice a week (FM_5) were selected for the study.

In the present study, the gross return, net profit and benefit cost ratio on best fertilizer modules was worked out for the production of rooted cuttings of carnation for an area of 500 square metres on the basis of input and output involved. The cost of labour and various inputs were taken as per the local market rates. The sale price of rooted cuttings of carnation was adopted from the price list of Department of Floriculture and Landscaping of Dr. Yashwant Singh Parmar University of Horticulture and Forestry, Nauni, Solan, Himachal Pradesh.

RESULTS AND DISCUSSION

Economics of rooted carnation cutting production for 500 m^2 of different fertilizer modules for four commercial cultivars

The agronomic practices followed for establishment and maintenance of carnation crop in an area of 500 m square are presented in Table 1. Different cost components for carnation cutting production were evaluated taking into account the input cost involving preparatory cultivation, manures and fertilizers, intercultural operations, harvesting and plant protection. The total cost was calculated for each fertilizer module and the total returns calculated based on the yield of the cuttings and the prevailing rate of rooted cuttings in the university (₹ 6/rooted cutting). The economic returns were computed by deducting the total cost incurred for each fertilizer module from total returns.

The economic analysis revealed that the maximum gross returns in cultivars Niva (₹ 1378440), Farida (₹ 1285200) and Madras (₹ 1280160) were obtained from fertilizer module FM_5 comprising of 20-5-5 g/m^2 NPK as basal dose and 200 ppm N + 280 ppm K as fertigation twice a week, while, cultivar White Wedding showed maximum gross return (₹ 1239840) from fertilizer module FM_4 composed of 20-15-10 g/m^2 NPK as basal dose and 175 ppm N + 245 ppm K as fertigation twice a week. These results are in accordance with the findings of Sharma (2000), Budiarto *et al*. (2006) and Singh and Chettri (2013) in chrysanthemum. The better growth parameters under fertilizer module FM_5 in cultivars Farida, Niva and Madras and with fertilizer module FM_4 in White Wedding may be ascribed due to the more availability of nutrients and its synchronization with the uptake. Lower dose of fertilizers resulted in minimum weight and yield of the cuttings. Verma *et al*. (2011) stated that a fertilizer treatment T_8 comprising of *Azospirillum*, PSB, vermicompost and 50% RDF resulted maximum returns (₹ 325504) and benefit cost ratio (6.04:1) in chrysanthemum cv. Raja. It was also noticed that the fertilizer module FM_5 resulted maximum net profit and benefit cost ratio in cultivars Niva (₹1234091.20, 8.55:1), Farida (₹1140851.20, 7.90:1) and Madras (₹1135811.20, 7.87:1), respectively. Whereas, cultivar White Wedding recorded maximum net profit (₹1095434.43) and benefit cost ratio (7.59:1) from fertilizer module FM_4. These results corroborate with the findings that treatment combination of *Azospirillum* + PSB + FYM + 75 per cent RDF resulted maximum gross returns (₹ 503730), net returns (₹ 375223) and highest benefit cost ratio (2.91:1) from an area of 560 square metre in carnation cv. Solo (Dalawai and Naik 2014). Mashaldi (2000), Sunitha *et al*. (2007), Dalal *et al*. (2009), Gharge *et al*. (2009), Renukaradya *et al*. (2011), Laishram (2012), Usman and Ashfaq (2013) and Momin *et al*. (2015) also reported similar findings with respect to the suitability of fertilizers for different ornamental crops. The minimum benefit cost ratio was noted from fertilizer module FM_1 comprised of basal fertilizer dose of 20-20-10 g/m^2 NPK and fertigation with 100 ppm N + 140 ppm K twice a week in the cultivars White Wedding (5.86:1), Farida (5.46:1) and Madras (6.26:1), respectively except the cultivar Niva (5.33:1) with FM_2 composed of 20-15-5 g/m^2 NPK as basal dose along with 125 ppm N + 175 ppm K given as fertigation twice a week.

The increased yield in carnation cuttings and ultimately monetary returns is attributed due to the suitability of the fertilizers for the growth and development of carnation plants with more number of leaves, branches/plant as well as plant spread which resulted in more number of cuttings per metre square and therefore, more returns per unit area. Sengar and Kothari (2008) also reported that farmers can get a benefit cost ratio (4.5:1) from a 550 square m from rose nursery. Further, Tarannum *et al*. (2014) suggested that farmers can get net income ranged from ₹ 126203 to 350483 from an area 560 square m/year by growing carnation.

The present study showed encouraging results with respect to higher economic return for carnation nursery. Farmer can get average net income ranging from ₹ 768206.57 with fertilizer module FM_2 to ₹ 1234091.20 with fertilizer

Table 1 Economics of rooted carnation cutting production for 500 m^2 of different fertilizer modules for different commercial carnation cultivars

Particulars	Quantity	Rate (in ₹)	Total Cost (in ₹)
Input Cost			
Preparatory cultivation			
Land preparation (Sieving soil, FYM, mixing and bed preparation)	22 man days	120/man day	2640
Planting material for 15 × 15 cm spacing in a net cultivated area of 350 m^2	12600	6/cutting	75600
Basal application of fertilizers and layout	1 man day	120/man day	120
Planting and irrigation	3 man days	120/man day	360
Application of vermicompost	1 man day	120/man day	120
Application of biofertilizers	1 man day	120/man day	120
Cost of cocopeat	3150 kg	15/kg	47250
Manuring			
Cost of biofertilizers			
Azospirillum	11.5 kg	50/kg	575
PSB	11.5 kg	50/kg	575
VAM	11.5 kg	20/kg	230
FYM	5250 kg	120/q	6300
Vermicompost	350 kg	10/kg	3500
Cost of fertilizers			
Urea			
Fertilizer Module 1	15.21 kg	5.37/kg	81.68
Fertilizer Module 2	15.21 kg	5.37/kg	81.68
Fertilizer Module 3	15.21 kg	5.37/kg	81.68
Fertilizer Module 4	15.21 kg	5.37/kg	81.68
Fertilizer Module 5	15.21 kg	5.37/kg	81.68
Single super phosphate (SSP)			
Fertilizer Module 1	43.75 kg	7.70 /kg	336.88
Fertilizer Module 2	32.81 kg	7.70 /kg	252.64
Fertilizer Module 3	21.88 kg	7.70 /kg	168.48
Fertilizer Module 4	32.81 kg	7.70 /kg	252.64
Fertilizer Module 5	10.94 kg	7.70 /kg	84.24
Muriate of potash (MOP)			
Fertilizer Module 1	5.83 kg	16.80/kg	97.94
Fertilizer Module 2	2.91 kg	16.80/kg	48.89
Fertilizer Module 3	2.91 kg	16.80/kg	48.89
Fertilizer Module 4	5.83 kg	16.80/kg	97.94
Fertilizer Module 5	2.91 kg	16.80/kg	48.89
Multi K			
Fertilizer Module 1	4.79 kg	95/kg	455.05
Fertilizer Module 2	5.99 kg	95/kg	569.05
Fertilizer Module 3	7.19 kg	95/kg	683.05
Fertilizer Module 4	8.38 kg	95/kg	796.10
Fertilizer Module 5	9.58 kg	95/kg	910.10
Calcium nitrate			
Fertilizer Module 1	1.99 kg	32/kg	63.68
Fertilizer Module 2	3.39 kg	32/kg	108.48
Fertilizer Module 3	4.88 kg	32/kg	156.16
Fertilizer Module 4	6.36 kg	32/kg	203.52
Fertilizer Module 5	7.85 kg	32/kg	251.20
Urea			
Fertilizer Module 1	1.34 kg	5.37/kg	7.20
Fertilizer Module 2	1.34 kg	5.37/kg	7.20

Table contd.

Table contd.

Particulars	Quantity	Rate (in ₹)	Total Cost (in ₹)
Fertilizer Module 3	1.34 kg	5.37/kg	7.20
Fertilizer Module 4	1.34 kg	5.37/kg	7.20
Fertilizer Module 5	1.34 kg	5.37/kg	7.20
Intercultural operations			
Pinching	1 man day	120/man day	120
Spraying insecticides	2 man days	120/man day	240
Fertigation	5 man days	120/man day	600
Irrigation	3 man days	120/man day	360
Weeding and hoeing	15 man days	120/man day	1800
Harvesting of cuttings	8 man days	120/man day	960
Plant protection			
Dithane M-45	1.5 kg	347/kg	520.50
Bavistin	1 kg	80/200g	245
Profenophos	500 ml	490/l	400
Simba	300 ml	275/250 ml	330

Total cost

Fertilizer Module 1	*Fertilizer Module 2*	*Fertilizer Module 3*	*Fertilizer Module 4*	*Fertilizer Module 5*
144007.92	144033.43	144110.95	144404.57	144348.80

Total yield of cuttings

Fertilizer Module (FM)	*White Wedding*	*Farida*	*Niva*	*Madras*
FM_1	164640	154980	159180	174300
FM_2	172200	164220	152040	181440
FM_3	172200	170520	179340	182406
FM_4	206640	202020	217098	205380
FM_5	198240	214200	229740	213360
Fertilizer Module (FM)	*White Wedding*	*Farida*	*Niva*	*Madras*
FM_1	987840	929880	955080	1045800
FM_2	1033200	985320	912240	1088640
FM_3	1033200	1023120	1076040	1094436
FM_4	1239840	1212120	1302588	1232280
FM_5	1189440	1285200	1378440	1280160

Net profit (D – B)

Fertilizer Module (FM)	*White Wedding*	*Farida*	*Niva*	*Madras*
FM_1	843832.08	785872.08	811072.08	901792.08
FM_2	889166.57	841286.57	768206.57	944606.57
FM_3	889089.05	879009.05	931929.05	950325.05
FM_4	1095435.43	1067715.43	1158183.43	1087875.43
FM_5	1045091.20	1140851.20	1234091.20	1135811.20

Benefit cost ratio (E/B)

Fertilizer Module (FM)	*White Wedding*	*Farida*	*Niva*	*Madras*
FM_1	5.86	5.46	5.63	6.26
FM_2	6.17	5.84	5.33	6.56
FM_3	6.17	6.10	6.47	6.59
FM_4	7.59	7.39	8.02	7.53
FM_5	7.24	7.90	8.55	7.87

module FM_5 in cultivar Niva from 500 m square area. Further, this fertilization module can be undertaken to produce the desired quantity of rooted carnation cuttings to meet the demand and to get the maximum returns. Carnation nursery has a bright future prospect for the farming community which can help them improve their socio-economic status.

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