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Impact of Foliar Application on Flower Yield and Quality in Carnation

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ABSTRACT: Studies on the impact of foliar application of biostimulants in carnation to improve the flower yield and quality (*Dianthus caryophyllus* L.) cv. Malaga was carried out. In the preharvest treatments, Panchagavya @ 2% + Manchurian mushroom tea 4% with RDF (NPK 19:19:19 @ 8g, calcium nitrate 1.5g, potassium nitrate 1.0g, mono potassium phosphate 1.5g, borax 0.5g, magnesium sulphate (2.5g) proved superior in respect of flower yield and quality *viz.*,number of flowers per plant (11.53), number of flowers (415.20/m^2) was high with A grade (410.7), B grade (3.0) and C grade (1.5) and longest vase life (14.46 days). The incidence of ca lyx splitting (3.18 %) and degrees of deviation was low.The physiological parameters of chlorophyll a (1.69 mg/g), chlorophyll b(0.65 mg/ g), total chlorophyll (2.45 mg/g), leaf nutrient content *viz.*, nitrogen (4.52 %), phosphorus (0.80 %) and potassium (4.08 %) was higher in the treatment Panchagavya @ 2% + Manchurian mushroom tea 4%.

Key words: Carnation, foliar spray, biostimulants, flower yield, quality parameters.

INTRODUCTION

Carnation (*Dianthus caryophyllus* L.) is one of the commercially important cut flowers of the world and ranks second in the cut flower trade after rose. Carnation, apart from producing cut flowers can also become useful in gardening for bedding, edging, borders, pots and rock gardens. Plants absorb nutrients through both roots and foliage. Foliar application of nutrients is gaining more importance in fertilization of various field and flower crops. The advantages of the foliar fertilizers were more obvious under growing conditions restricting the absorption of nutrients from the soil, as reported by Verma *et al.* (2003) in carnation. The application of foliar fertilizer is the quickest way to deliver nutrients to the tissues and organs of the crops. Despite the key role played by the fertilizers in increasing the yield, a total dependence on them in achieving a contemplated productivity is not fully justified. Furthermore an unabated appraisal in the use of chemical fertilizers can inflict irreparable damage to soil fertility and environment (Katyal, 1989). Downsizing the fertilizer use to protect the environment is therefore, not a viable strategy. At the same time, any saving in the consumption of chemical fertilizers without affecting the productivity is a social necessity. One of the strategies in this paradigm shift is the augmentation of chemical fertilizers with partial supplementation of organic source and certain nutrient generating components *viz.*, growth stimulants. This integrated approach aims at sustainable productivity with minimum deleterious effect of chemical fertilizers in view of both environment security and economic feasibility.

Panchagavya and Manchurian mushroom tea enhanced the biological efficiency of the plants and improved the quality while complete substitution of inorganic fertilizers cannot be contemplated yet; there are adequate reports on the role in improving the growth and quality of carnation. Foliar application of nutrients is gaining more importance in fertilization of various field and flower crops. The advantages of the foliar fertilizers is more obvious under growing conditions restricting the absorption of nutrients from the soil as reported by Verma *et al.* (2003) in carnation. The application of foliar fertilizer is the quickest way to deliver nutrients to the tissues and organs of the crops. Keeping in view the socio economic value of cut carnation, this study was intended to study the “Impact of foliar application on Flower Yield and Quality in Carnation” by spraying biostimulants such as panchagavya and manchurian mushroom tea to improve flower yield and quality in carnation.

MATERIALS AND METHODS

The experiment was carried out at Thummanatty, TheNilgris (SigaramSelfHelpGroup). The experiment was laid out in a Rand omized Block Design with nine treatments and replicated three times with each plot size of 1.0 x 1.0 m. Carnation cv. Malaga, a standard type was chosen for this study. Healthy rooted cuttings were obtained from Florance Flora Floriculture unit, Bangalore. Before planting, the experimental plots were applied with 1 kg vermicompost, 200g neem cake, 3kg farmyard manure, 100 g CAN, 200 g superphosphate, 150g muriate of potash, 50 g magnesium sulphate and 2 g borax per square meter were mixed in the beds and the rooted cuttings were planted at a spacing of 15 x 15 cm. Single pinch method were employed and after pinching, fertigation was scheduled and applied one month after planting. Schedule A (Monday & Thursday) - 1.5g Calcium Nitrate, 1.0g Potassium Nitrate, 8g of 19:19:19 NPK per square meter. Schedule B (Tuesday & Friday) -1.5g Monopotassium phosphate, 0.5g Borax, 2.5g Magnesium sulphate. Panchagavya and Manchurian mushroom tea were applied as foliar spray in different doses at 15 days interval starting from one month after planting. The treatments were :T_1-Panchagavya @ 2%, T_2-Panchagavya@4%, T_3- Manchurian mushroom tea @2%, T_4- Manchurian mushroom tea @ 4%,T_5- Panchagavya @ 2% +Manchurian mushroom tea @ 2%, T_6- Panchagavya @2%+Manchurian mus hroom tea @ 4%, T_7- Panchagavya @ 4% + Manchurian mushroom tea @ 2%, T_8 - Panchagavya @ 4% + Manchurian mushroom tea @ 4 % and T_9 - Control. The observations were recorded on ten randomly selected plants every month after planting to harvest. To estimate the strength of the flower stalk, cut flower stalk were held horizontally at a point 25 cm above the base and deviation of the flower head below the horizontal line was recorded and expressed in degrees and the cut flower with deviation less than 15º was kept under A grade. The present investigation on "the impact of foliar application on flower yield and quality in carnation" under polyhouse condition was undertaken with an attempt to enlighten on the effect of biostimulants on flower yield and quality in carnation and to optimize the nutritional requirement.

RESULTS AND DISCUSSION

Application of panchagavya 2% as foliar spray helped in the translocation of N present in soil and this is in consonance with the findings of Kanimozhi (2004) in *Baccopa monnieri* L., Sivakumar (2004) in *Solanum nigrum* L., Sanjutha (2005) in *Andrographis paniculata* Nees. and Muthamizhselvi (2006) in chrysanthemum.

Flowering parameters

Apart from the quality, the size of a flower is the parameter that initially captures the consumer's eye. In the present study, the treatment Panchagavya 2% + Manchurian mushroom tea 4% resulted in higher number of flowers per plant. The total number of flowers (415.20/m^2) with stem length more than 55 cm was A grade (410.7 flowers/m^2), B grade (3.0 flowers/m^2) and C grade (1.5 flowers/m^2) lie under of the total number of flowers. These results indicate the superiority of the treatment Panchagavya 2% + Manchurian mushroom tea 4% over other treatments as regards to production of quality as well as higher number of flowers. Increased number of flowers per plant was significantly influenced by the application of organic manures combined with inorganic fertilizers and bio stimulants. The increased yield due to nitrogen application could be explained that upon the onset of flowering phase, there was an improvement of anabolic activities as well as modification and redistribution of organic manures and inorganic fertilizers. Thus, the incoming nitrogen that was earlier utilized by the vegetative part was translocated towards reproductive organs, where it combined with oxygen evolved during photosynthesis and formed amino acids. On condensation, these amino acids form proteins that ultimately increased the production of number of flowers per plant and weight of the flowers. These results were also confirmed with the findings of Beniwal *et al*. (2005) in chrysanthemum, Basappa *et al*. (1990) in everlasting flower and Anuradha *et al*. (1990) in marigold. The number of petals per flower was found to be high in the treatment Panchagavya 2% + Manchurian mushroom tea 4% compared to that of control. Even though more number of petals was present in the flowers this treatment exhibited less calyx split showing the compactness of the bud.

The degree of deviation is the deviation of the stalk from 90º. The treatment Panchagavya 2% + Manchurian mushroom tea 4% resulted in least deviation of 1.70 degrees resulting strong stalk strength**.** This might be due to an altered efficiency of the respective microorganisms by the spray of biostimulants in modifying the strength of the stalk as reported by Gayathiri (1997) in carnation. The incidence of calyx splitting (3.18 per cent) is very low in the treatment Panchagavya - 2 % + Manchurian mushroom tea - 4 %. The disorder is expressed as a result of widely varying causes including an imbalance of nutrients as a consequence of wide fluctuation in tissue N levels and as the leaf nitrogen increased, there was decrease in the incidence of calyx splitting (4.33%) observed at 2.241 leaf N content as reported by Verma *et al.*(2003). The incidence of leaf spot (*Alternaria dianthi*) was seen in the field and the level of incidence significantly differed among the treatments. The split generally occurs 10-14 days before full opening of the flower, following increased volume of petals within the calyx even after attainment of full size of the calyx. The increased calyx split was noticed as a result of temperature fluctuation during October to February as reported by Gayathiri (1997). As leaf nitrogen increased, there was decrease in the incidence of calyx splitting (4.33%) observed at 2.241 leaf N content as reported by Verma *et al.*(2003). In the present case also, an increase in N content reduced the severity of the leafspot. This is in accordance with the earlier findings of Vivekanandan (1999) reported that panchagavya spray @ 1 per cent doubled the fruit yield besides giving resistance to pest and diseases.

Physiological parameter

The chlorophyll a, b and total chlorophyll content was highest in the treatment (Panchagavya 2% + Manchurian mushroom tea 4%) with 1.69, 0.65 and 2.45 mg/g respectively. The variation in chlorophyll content of the leaf might be due to the spray of biostimulants. Similar variation for chlorophyll content among different cultivars might be due to genetic constitution of the cultivars as postulated by Patil (2001) in carnation. Chlorophyll is an important pigment involved in photosynthesis, greatly influenced under protected condition. The increase in chlorophyll content under this condition is an adaptive mechanism commonly observed in plants to maintain the photosynthetic efficiency as observed by Attridge (1990). It is obvious that nitrogen forms an important part of the chlorophyll molecule and when present in sufficient amounts promote healthy growth, increases the photosynthetic activity results in increasing the yield and this was in agreement with the previous works by Jaisinghani *et al.* (1964). In addition, the inorganic fertilizers treatment combination with

foliar spray of biostimulants would have also enhanced the chlorophyll pigment mainly by its ability to fix atmospheric nitrogen (which had direct correlation with the chlorophyll content).

Leaf Nutrient Status

The nutritional diagnosis of carnation showed an increased level of nitrogen (4.52 %), phosphorous (0.80 %) and potassium (4.08 %) in the treatment Panchagavya 2% + Manchurian mushroom tea 4%. A positive linear relationship was found between nitrogen content of leaves, days taken for bud initiation, days to flowering, flower size, plant height, stem length, stem strength and yield as ascertained by Verma *et al*. (2003) and Jitendra *et al*. (2003) in carnation. Phosphorous content of leaves was related with nitrogen content. It might be due to the fact that at high nitrogen content there was more vegetative growth and better quality, which resulted in more uptake and utilization of phosphorous as reported by Verma *et al*. (2003) in carnation. The increase in K content at high nitrogen levels may be attributed to the fact that with high rate of photosynthesis, the amount of inorganic nutrients might be correspondingly high. This facilitates the conversion of photosynthates into numerous metabolites for vegetative growth as reported by Mengal and Kirtby (1987).

CONCLUSION

It is quite obvious that the biostimulants play a surmountable role in improving the growth and quality of carnation. The foliar application of biostimulant (Panchagavya 2%+ Manchurian mushroom tea 4%) also enhanced the flower yield and quality of carnation flowers.

Table 1. Mean performance of flowering and quality parameters in Carnation cv. Malaga

Treatments	Number of flowers per plant	Calyx splitting (%)	Degrees of deviation	Vase life (days)	Number of flowers/m^2	Number of flowers/m^2		
						A grade	B grade	C grade
T1	7.47	15.14	9.40	10.63	268.80	254.1	10.2	4.5
T2	8.33	10.85	9.20	10.40	300.00	277.9	13.6	8.5
T3	8.07	18.60	15.00	12.26	290.40	269.2	9.2	12.0
T4	9.03	20.30	11.50	12.60	325.20	313.2	7.0	5.0
T5	7.90	21.95	9.90	12.36	284.40	265.7	8.7	10.0
T6	11.53	3.18	1.70	14.46	415.20	410.7	3.0	1.5
T7	8.40	12.69	6.10	12.60	302.40	283.1	11.5	7.8
T8	10.43	15.37	9.20	13.00	375.60	367.6	5.0	3.0
T9	7.23	31.59	25.30	10.00	260.40	225.3	14.6	20.5
SEd	0.20	16.63	10.81	0.100	313.60	3.885	0.633	0.520
CD (0.05)	0.42	0.74	0.520	0.220	5.766	7.723	1.244	1.110

Calyx spilitting: High -50% and above, Medium - 30-50%, Low - less than 30%
Degree of deviation: A grade - less than 15º, B grade - 15 - 30º, C grade - more than 30º

Table 2. Mean performance of physiological parameters in Carnation cv. Malaga

Treatments	Chlorophyll a (mg/g)	Chlorophyll b (mg/g)	Total Chlorophyll (mg/g)	Leaf nutrient content		
				Nitrogen (%)	Phosphorus (%)	Potassium (%)
T1	1.34	0.55	2.20	3.24	0.75	3.07
T2	1.58	0.59	2.38	4.25	0.78	4.01
T3	1.42	0.46	2.07	3.25	0.75	3.15
T4	1.29	0.46	1.95	2.99	0.70	3.18
T5	1.41	0.49	2.21	3.98	0.77	3.85
T6	1.69	0.65	2.45	4.52	0.80	4.08
T7	1.52	0.56	2.25	4.31	0.79	4.01
T8	1.60	0.47	2.25	4.04	0.78	3.95
T9	1.29	0.42	1.85	2.98	0.65	2.78
SEd	0.008	0.003	0.012	0.020	0.005	0.030
CD (0.05)	0.017	0.006	0.025	0.050	0.009	0.070

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