



Research Article

INFLUENCE OF DIFFERENT ORGANIC MANURES AND BIO-FERTILISERS ON MORPHOLOGICAL, FLORAL AND BULB TRAITS OF NARCISSUS (DAFFODIL Cv. "SALOME")

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Abstract- Experiment was conducted with an aim to know the effect of different organic manures and bio-fertilizers on morphological, floral and bulb traits on Narcissus (Daffodil) cv. "Salome". Seven different nutrient combinations were tested with distinct range of organic manures viz. vermicompost (1.5 t/h, 2.5 t/h, 5 tones /ha.), Sheep manure (1.5 t/ha, 2.5 t/h, 5 t/h) and recommended dose of NPK without organic manures as control treatment. In addition to these manures, all bulbs were treated with Azotobacter and Phosphorus Solubilising Bacteria (PSB) before planting. It was observed that treatment T₃ (Vermicompost 5t/ha+ Azotobacter+ PSB) resulted with earliness in bulb sprouting, bud initiation and to reach goose neck stage. However, the treatment T₅ (1.25 t/ha vermicompost +1.5t/ha sheep manure+ Azotobacter+ PSB) resulted in delay of bulb sprouting, bud initiation and duration to reach goose neck stage. From qualitative parameters point of view maximum tepal length (34.61mm), spa the length (40.97cm), flower diameter (79.47mm) and duration of flowering (26.86 days) resulted with the treatment T₃ and minimum values for all these traits were observed with treatment T₅. Bulb weight was recorded maximum (24.48g) with treatment T₃ (vermicompost 5t/ha+ Azotobacter +PSB) and minimum (16.12g) with treatment T₅ (1.5 t/h sheep manure+ Azotobacter +PSB) while as bulb diameter followed the same trend with maximum (33.21mm) with T₃ and minimum (20.10mm) with T₅.

Keywords- Bulb, Bio-Fertilizer, Floral, Growth, Yield.

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Introduction

Flower cultivation has been practised since times immemorial but it is only in the recent years that floriculture blossomed into viable business option. Europe, America and Asia account for more than 90 percent of total world trade in floricultural products. In India too floriculture is being viewed as a high growth industry where flower consumption is increasing annually by 35 percent. Domestic industry is growing at an annual rate of 10-20% per annum. Tamil Nadu is the leading producer of loose flowers followed by Karnataka both in terms of area and production. West Bengal is leading in cut flowers stems followed by Karnataka [19]. Obviously there is a fast growing demand of flowers and floral products throughout the world. Narcissus holds an important place among flowering temperate bulbous flower crops. The flower is a symbol of self esteem and regard besides valued from landscape point of view. As a cut flower Narcissus finds special position as it can be grown under open field conditions under temperate conditions. Besides this it is the first spring flower and for the same reason called as flower of hope. The crop ranks second only to tulip as far as area under bulbous crops is concerned. However, its commercial cultivation is mainly confined to Europe. The demand for Daffodils is increasingly growing as a cut flower and landscape plant. Therefore there is a great scope to increase its commercial cultivation apart with production and productivity so as to meet the increasing demand. However, there is no local supply of good-quality bulbs for cut flower production. On the other hand, the cost of Different types of imported bulbs, has become double from INR 10 to 20 during last three to 4 years and the fluctuation value of euro against rupee has made import of bulbs all the more expensive [25]. One of the pre requisite for boosting of yield is to provide balanced

dose of nutrients for better growth and quality production. Nutrients play an important role in determining the growth and yielding ability of crop apart with enhancement of qualitative and quantitative characters. The indiscriminate uses of chemical fertilizers alter the soil fertility and increase cost of production as well. The concept of nutrient management through organic sources and bio-fertilisers is to maintain and improve soil productivity on long term for optimum growth and quality yield. The present day need which force to concentrate on nutrient management is due to some burning issues in agro-technology including the need for increase in production with shrinkage of land resource, unavailability of sufficient inorganic fertilizers. Besides this the literature available on nutrient use efficiency indicates that neither incorporation of organic manures and bio-fertilisers in ornamental bulbous crops can achieve quality flower and bulb productivity. Integrated nutrient strategies gives emphasis on reduction of nutrient losses, retention of soil moisture apart with improvement in physical, chemical and biological properties of soil [17] observed higher values of soil in terms of available soil NPK and organic carbon by incorporation of vermicompost. Bio-fertilizers are micro organisms which are capable of mobilizing nutritive elements from non usable forms to usable forms through biological processes. These may be biological nitrogen fixers, phosphate solubilizers or any other such organism. Soil bacterization with Azotobacter improves quality and yield [15] and [11] Azotobacter inoculation improve yield and quality of produce by nitrogen fixation apart with enhance uptake of Fe, Zn, Cu and Mo [1]. PSB improves the available soil phosphorus and enhance the uptake of phosphorus either by solubilisation of fixed or added phosphorus which in turn led to high crop yield [7] and [18]. Considering the aforesaid advantages of nutrient management strategy, the

integrated approach of sheep manure or vermicompost and bio-fertilizers for quality daffodil production in sustainable manner can be undebly accepted but at what ratio is always questionable. Hence the study was conducted to work out the different treatment combinations of organic manures with integration of bio fertilizers for optimizing their doses for integrated nutrient management of Daffodils for quality flower production.

Material and Methods

The present investigation entitled "Influence of different organic manures and bio-fertilisers on morphological, floral and bulb traits of Narcissus (Daffodil) cv Salome" was carried out during 2013-14 at experimental field of the Division of FMAP, SKUAST K Shalimar. Eight months study programme was framed from Oct 2013 to May 2014. Bulbs were planted in the month of October. The experiment was laid out in Randomized Block Design with seven treatments replicated three times. The allocation of different treatments was done randomly in each replication.

Treatment details

T ₁	Vermicompost 2.5t/ha +Azotobacter+PSB
T ₂	Sheep manure2.5t/ha +Azotobacter+PSB
T ₃	Vermicompost 5t/ha+Azotobacter+PSB
T ₄	Sheep manure5t/ha+Azotobacter+PSB
T ₅	1.5t/ha sheep manure+Azotobacter+PSB
T ₆	1.5 t/ha vermicompost +Azotobacter+PS
T ₇	Recommended dose of NPK.

Details of Experiment and Recorded observations

Spacing : 15cm x 15 cm

Design Randomized Block Design

Irrigation, weeding, hoeing, plant protection measures and other accessory operations were carried out as and when required. Application of Sheep manure, Vermicompost and Biofertilizers. Sheep manure and Vermicompost were applied individually as well as in integrated way as per the requirement treatment wise at the time of soil preparation. Bulbs were treated with solution of *Azotobacter chroococcum* and *Bacillus megaterium* var. *Phosphaticum* and shade drying was followed before planting.

For recording various biometric observations three plants in each plot were selected randomly and tagged for recording observations on growth and flowering attributes at successive stages. The mean of the three plots of three replications was considered as an average for a particular treatment. Observations recorded include. Days taken to sprouting after bulb plantation. Days to first bud appearance from date of planting, Days taken to reach pencil stage after bud initiation, Days to colour break after bud maturity, Days for complete opening of flower after colour break, bud size at goose neck stage (mm), diameter of flower(mm), number of petals per flower, Flower stalk length, bulb weight (g),bulb diameter(mm). Experimental data was analyzed statistically adopting the techniques of analysis of variance (ANOVA) for Randomized Block. The level of significance of the treatment mean square at 5% probability was tested against F calculate value for Randomised Complete Block Design RCBD.

Results and Discussion

At all crop growth stages significant variation in vegetative and reproductive stages was observed among different treatments. It was observed that treatment T₃ (Vermicompost 5t/ha+ Azotobacter+ PSB) resulted with earliness in bulb sprouting, bud initiation and to reach goose neck stage. However, the treatment T₅ (1.25 t/ha vermicompost +1.5t/ ha sheep manure+ Azotobacter+ PSB) resulted in delay of bulb sprouting, bud initiation and duration to reach goose neck stage. From qualitative parameter point of view maximum tepal length (34.61mm), spa the length (40.97cm),flower diameter (79.47mm) and duration of flowering (26.86 days) resulted with the treatment T₃ and minimum values for all these traits were observed with treatment T₅. Vermicompost is well known to contain macro elements besides Fe, Zn and provides an excellent atmosphere for proliferation of

micro organism besides improves enzymatic activity. Azotobacter inoculation increases the microbial population in the minor rhizosphere and enhances nitrogen fixation. This in turn enhances availability of N nutrients to plants. Moreover it releases growth substances which prove for better development of plant. Phosphorus Solubilizing Bacteria PSB on the other hand secrete organic acids which form chelates and such chelation results in effective solubilization of phosphate [14]. Besides this PSB increase efficiency of phosphorus uptake and improves the means of nitrogen uptake as phosphorus is know to increase uptake of nitrogen. Dominance of treatment T₃ (Vermicompost 5t/ha+ Azotobacter+ PSB) to all other treatments in terms of vegetative characteristics could be due to optimum nutrient supply provided to plants as balanced nutrient supply plays an important role in enhancing vegetative growth and development of plant. These results are in close association with the findings of [8] for statics, who reported that integrated approach of vermicompost, inorganic fertilizer and bio-fertilizer improve general growth characters. Similarly, the release of plant growth regulators by auxins and gibberellins by Azotobacter culture has been reported by [4]. [12] documented the cytokinin synthesis by Azotobacter culture. Likewise [13] reported the similar impact of Azotobacter in egg plant. [18] reported PSB application led to vigorous growth due to solubilization of phosphates and [2] reported that production of IAA, GA and cytokinin in culture of PSB. All above findings are in close association with the findings of this investigation. Application of vermicompost significantly influences shell life, corm number and diameter in Gladiolus. Application of organic and inorganic fertilisers induced positive and significant changes in growth and development of Asiatic Lilium [22] and [9]. Optimum application of Nitrogen resulted in proper growth, development and bud qualityof Narcissus Daffodils cv Tunis [21]. Biofertilizer application to corms helps in proper development of plant and enhance number of corms and cormels [23]. Vermicompost application promotes growth and quality flower production in Anthurium [20] and [24].

Flowering Parameters

Sprouting of bulb after bulb plantation was recorded early (95.33 days) with treatment vermicompost t/h+ Azotobacter +PSB and followed by (124.77 days) with treatment 1.5 t/h sheep manure+Azotobacter+PSB [Table-1]. Similarly least days from bud initiation to pencil stage (10.33 days) with treatment T₃ (Vermicompost 5t/h+Azotobacter+PSB) and followed by (11.33 Days) with treatment T₅ (1.5 t/h sheep manure+ Azotobacter+ PSB), Days for Goose neck stage was recorded early (3.66 days) with treatment T₃ (vermicompost 5t/h+ Azotobacter+ PSB) followed by (6.33 days) with treatment T₅ (1.5 t/h sheep manure+ Azotobacter+PSB) , Likewise days from goose neck stage to anthesis of flower followed the same trend with minimum days (4.33 days) and maximum (6.33days) with T₃ and T₅ respectively. Similarly Tapel length and flower diameter was recorded maximum (34.61mm and 79.47mm respectively) with treatment T₃ (vermicompost 5t/h+Azotobacter+PSB) and minimum (28.46 and 69.01mm respectively) with treatment T₅ (1.5 t/h sheep manure+Azotobacter+PSB) [Table-2]. Spath length was recorded maximum (40.97mm) with treatment T₃ (vermicompost 5t/h+Azatoacter+PSB) followed by (32.5mm) with treatment T₅ (1.5 t/h sheep manure+Azotobacter+PSB), Spath diameter was recorded maximum (9.15mm) with treatment T₃ (vermicompost 5t/h+Azotobacter+PSB) followed by (6.19mm) with treatment T₅(1.5 t/h sheep manure+Azotobacter+PSB), Bud size of goose neck stage was recorded maximum (58.60mm) with treatment T₃ (vermicompost 5t/h+Azotobacter+PSB)) followed by (56.76 mm) with treatment T₅ (1.5 t/h sheep manure+Azotobacter+PSB), similarly Corna length was recorded maximum (17.47mm)with treatment T₃(vermicompost 5t/h+Azotobacter+PSB)) followed by (13.44mm) with treatment T₅ 1.5 t/h sheep manure+ Azotobacter+ PSB), Duration of flowering was recorded maximum (26.86days) with treatment T₃ (vermicompost 5t/h+ Azotobacter +PSB) followed by (22.56 days) with treatment T₅ (1.5 t/h sheep manure+ Azotobacter +PSB), Likewise highest values for bud diameter (33.21 mm) were observed with treatment T₃ (vermicompost 5t/h+ Azotobacter +PSB) followed by treatments T₅ with bud diameter (20.10mm). Spath length was recorded maximum (31.99 cm) with T₃ (vermicompost 5t/h+ Azotobacter +PSB) followed by (32.5mm) with treatment T₅ (1.5 t/h sheep manure+ Azotobacter +PSB), Bud size of goose neck stage was recorded

maximum (58.60mm) with treatment T₃ (vermicompost 5t/ha+ Azotobacter +PSB) followed by (56.76 mm) with treatment T₅ (1.5 t/ha sheep manure+ Azotobacter +PSB). Most of the variation in reproductive characteristics among the treatments very significant [Table-2]. From physiological point of view balanced amount of nitrogen, phosphorus and potassium is pre requisite for flower initiation as these are involved in the initiation of flower primordial formation. The better performance of treatment T₃ for earliness in bud initiation, bud maturity, colour break and anthesis could be due to enhanced growth at rapid speed by increased availability of nutrient (NPK) to plant during all the growth stages. The role of

integrated nutrient sources i.e. vermicompost, inorganic fertilizer, Azotobacter and PSB may be attributed to transport of cytokinin to axillary buds which helps in breaking apical dominance. This in turn led to fast mobilization of photosynthesis, transportation of phyto hormones to the shoots and induction of early flowering. Besides this phyto hormones produced by Azotobacter and PSB influences wall pressure and turgor pressure of cell which lead to quick cell enlargement and division at the merostematic portion and advances flowering. These results for earliness in floral characters are in similarity to the findings of [8] for statice, [5] for marigold and [10] for crossandra and [3] for tuberose.

Table-1 Influence of different organic manures on floral biology of *Narcissus (Daffodil) cv Salome*

Treatment	Days taken to sprouting after bulb planting	Days taken from Bud initiation to pencil stage	Goose neck stage	Anthesis	Tepel length (mm)	Flower diameter (mm)
Vermicompost 2.5t/ha +Azotobacter+PSB+VAM	121.44	11.99	4.76	5.63	28.70	70
Sheep manure 2.5t/ha +Azotobacter+PSB+VAM	119.86	11.66	6.23	4.76	24.47	69.44
Vermicompost 5t/ha+Azotobacter+PSB+VAM	94.33	9.33	3.71	4.43	34.61	80.00
Sheep manure5t/ha+Azotobacter+PSB+VAM	124.55	10.98	5.33	6.51	33.44	77.53
1.5t/ha sheep manure+Azotobacter+PSB	125.87	12.34	6.53	6.73	29.41	70.01
1.5 t/ha vermicompost +Azotobacter+PSB	120.44	11.78	5.76	4.65	33.89	77.67
Recommended dose of NPK.	123.33	10.45	5.66	5.78	33.79	76.80
CD p≤0.05	2.05	0.11	0.31	0.17	0.40	0.23

Table-2 Influence of different organic manures on morphological and floral traits of *Narcissus (Daffodil) cv Salom*

Treatment	Spathe length (cm)	Spathe Diameter (mm)	Bud size goose neck stage(mm)	Corona length(mm)	Duration flowering (Days)	Plant height(cm)
Vermicompost 2.5t/ha +Azotobacter+PSB	33.91	6.38	56.76	13.75	24.66	35.49
Sheep Manure2.5t/ha +Azotobacter+PSB	33.16	6.14	57.12	13.43	25.99	36.32
Vermicompost 5t/ha+Azotobacter+PSB	40.97	9.15	58.60	17.47	26.86	45.46
Sheep Manure5t/ha+Azotobacter+PSB	38.76	7.24	57.98	15.01	25.333	43.66
1.5t/ha Sheep Manure+Azotobacter+PSB	32.5	6.19	56.4	13.44	22.56	35.44
1.5 T/ha Vermicompost +Azotobacter+PSB	39.97	8.48	56.98	17.09	24.88	42.33
Recommended Dose Of NPK.	32.47	7.71	56.45	16.55	25.21	36.44
CD p≤0.05	0.15	0.09	0.26	0.11	0.20	0.35

Yield parameters.

Bulb weight was recorded maximum (24.48g) [Table-3] with treatment T₃ (vermicompost 5t/ha+ Azotobacter +PSB) and minimum (16.12g) with treatment T₅ (1.5 t/ha sheep manure+ Azotobacter +PSB) while as bulb diameter followed the same trend with maximum (33.21) with T₃ and minimum (20.10) with T₅. The significant improvement of bulb weight and bulb diameter by T₃ (vermicompost 5t/ha+ Azotobacter +PSB) over all other treatment could be due to better nutrient availability, translocation of growth substances, proper photosynthesis and maintenance of proper physiological and biochemical activities of the plant at optimum nutrient levels of NPK. Co related findings were reported by [6] for gladiolus and [16] for tuberose.

Table-3 Influence of different organic manure on different bulb characteristics in *cv. Salome*

Treatments	Bulb diameter (mm)	Bulb weight(g)
Vermicompost 2.5t/ha +Azotobacter+PSB	28.82	21.84
Sheep manure2.5t/ha +Azotobacter+PSB	27.21	21.44
Vermicompost 5t/ha+Azotobacter+PSB	33.21	24.48
Sheep manure5t/ha+Azotobacter+PSB	32.24	22.24
1.5t/ha sheep manure+Azotobacter+PSB	20.10	16.12
1.5 t/ha vermicompost +Azotobacter+PSB	25.67	22.24
Recommended dose of NPK.	24.22	18.87
CD p≤0.05	1.25	1.09

Conclusion

Use of organic manures and bio-fertilisers improves vegetative, floral and bulb characteristics in *Daffodil cv. Salome*. Besides this improvement in soil characteristics was observed during the course of investigation. Out of all organic manures vermicompost in integration with bio-fertilisers significantly influenced vegetative, floral, bulb and soil characteristics in *Salome cv. of Daffodils*.

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Author Contributions:

All author equally contributed.

Conflict of Interest: None declared

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