Original Research Article

RESPONSE OF CARNATION VARITIES (*Dianthus caryophyllus*) TO MYCORRHIZAL FUNGI UNDER NATURALLY VENTILATED POLYHOUSE CONDITIONS IN PRAYAGRAJ

ABSTRACT

The present investigation entitled, Response of carnation varities (*Dianthus caryophyllus*)to mycorrhizal fungi under naturally ventilated polyhouse conditions in Prayagraj was conducted at horticulture research field, Department of Horticulture,Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences,Prayagraj, U.P, during winter season(2022).The experiment was laid out in Factorial Randomized block design (FRBD) with 3 varities and 4 VAM treatments in 15 treatments and each replicated thrice. From present investigation Variety-3(Kiro-yellow) treated with 10g VAM per plant performed better for plant height(55.44), primary branches(7.22), bud diameter(21.72mm), yield per plant(5.74).In terms of flower diameter(6.16cm) and vaselife(13.33days) in Variety-1(Cerventes) treated with 10g VAM perfirmed better.. In terms of first bud initiation Variety-2(Baltico-White) treated with 5g VAM per plant showed better performance (59.11 days).

Keywords: Carnation, VAM, Varities, Biofertilizers, Yield

Introduction

The second-most popular flower in the world now is the carnation (*Dianthus caryophyllus*). On important occasions, carnations are frequently worn to convey feelings of love, intrigue, and distinction. It is the flower of choice on Mother's Day since it is a sign of mother love. The fact that these flowers were used to adorn Greek athletes' crowns suggests that the English name "carnation" is derived from the Greek word "coronation." The carnation is Spain's official flower.An good cut flower crop is the carnation, a member of the Carphyllaceae family of herbaceous plants also known as grenaide or clove pink. The word "Dianthus" is a combination of the Greek words "dios," which means "God" or "divine," and "anthons," which means "flower," hence the name "Divine Flower."The Greek words

“caryan” and “phyllon,” which both mean "leaf," were combined to create the name “caryophyllus,” which refers to the species. The globe over, carnations are grown. They are believed to be native to the Mediterranean region and have the diploid chromosome number 2n=30.

Biofertilizers seek to increase their efficiency, create fresh microbial strains, perfect application methods, and make them more compatible with contemporary farming methods. A sustainable and environmentally friendly method of managing nutrients in floriculture is provided by biofertilizers. They have the potential to increase soil health, reduce the negative effects of conventional farming methods on the environment, and promote the production of food that is sustainable.Biofertilizers have proven to be cost-effective, environmentally friendly inputs with great yields for floriculture crops.Rhizobium, Azospirilium, Azotobacter, Phosphobacteria, and Mycorrhizae are examples of commonly utilised biofertilizers.

Mycorrhizae is a type of fungus that creates nodules in symbiotic relationships with plants. plays a significant part in the ecosystem's nutrient cycling and shields plants from environmental stress. Mycorrizae enables the plant to absorb additional nutrients and moisture, which promotes plant growth and hastens the emergence of roots. Because the symbiosis improves nutrient cycling, roots, plant establishment, vegetative development, accelerates budding and flowering, and promotes the plant's ability to resist drought and salt stress, the application of Mycorrhizae to carnations promotes plant growth, enhances flowering, and increases yield.

From different types mycorrhizae commonly used one Vesicular ArbuscularMycorrhizae(VAM) in floriculture industry. VAM is considered a bio-fertilizer as it has the capability of fixating phosphates present in the soil. Vesicular arbuscularmycorrhizae (VAM) enhance plant growth through increased nutrient uptake, stress tolerance and disease resistance. As an integral part of the root system, they interact with other micro organisms in soil and result in increased root exudation approaching about 25% of the plant dry matter production.VAM Bio-Fertilizer facilitates better water absorption especially during water stress conditions and facilitates efficient absorption of various macro and micronutrients, primarily phosphorus.Its natural capability is also to increase the percentage content of trace elements. This is why it is widely used for the restoration of the fertility of barren or abandoned lands. For improving the crop quality in ornamental crops VAM is recommended(**Raverkar*et.al* 1990).**For carnation VAM along with other

biofertilizers increases plant height, reduces number of days for first flowering, maximum size and best vase life (**Guptha *et al.*, 2004**) and acts as best supplement for improving flower production in carnation.

Material and Methods

Geographic location and climate

The experiment was conducted during the winter season 2022, in Horticulture research field, Department of Horticulture, Naini Agricultural Institute, SHUATS, Prayagraj (U.P.) which is located at 25°39' 42''N latitude, 81°67'56" E longitude and 98 m altitude above the mean sea level. This area is situated on the right side of the Yamuna River by the side of Prayagraj - Rewa road about 12 km from the city. The area of Prayagraj district comes under subtropical belt in the South east of Uttar Pradesh, which experience extremely hot summer and fairly cold winter. The maximum temperature of the location reaches up to $46^{o}C$ – $48^{o}C$ and seldom falls as low as $4^{o}C$ – $5^{o}C$.The relative humidity ranges between 20 to 94 per cent. The average rainfall in this area is around 1013.4mm annually.

Experiment details

The experiment was laid out in Factorial Randomized Block Design with two factors(FactorA-Varities,FactorB-VAM) in fifteen treatments replicated thrice i.e.,(T_1)Variety-1(Cerventes)+Control,(T_2)Variety-1(Cerventes)+2.5gVAM/Plant, (T_3)Variety-1(Cerventes)+5gVAM/Plant,(T_4)Variety-1(Cerventes)+7.5gVAM/Plant, (T_5)Variety-1(Cerventes)+10gVAM/Plant,.

(T_6)Variety2(Baltico)+Control,(T_7)Variety2(Baltico)+2.5gVAM/Plant,(T_8)Variety-2 (Baltico)+5gVAM/Plant,(T_9)Variety-2(Baltico)+7.5gVAM/Plant,(T_{10})Variety-2 (Baltico)+10gVAM/Plant.

(T_{11})Variety-3(Kiro)+Control,(T_{12})Variety-3(Kiro)+2.5gVAM/Plant,(T_{13})Variety-3(Kiro)+5g VAM/Plant,(T_{14})Variety-3(Kiro)+7.5gVAM/Plant,(T_{15})Variety-3(Kiro)+10g VAM/Plant.

Results and discussion

Vegetative parameters

The results of experiment revealed plant height at 60 Days after pinching was recorded 55.44cm in T_{15}Variety3(Kiro-yellow) treated with 10g VAM per plant followed by 54.44cm

in T_5 Variety1(Cerventes-pink) treated with 10g VAM per plant smallest recorded 19.11cm in T_1 Variety1(Cerventes-pink) with control. Number of primary branches after 60 days after pinching more in number recorded 7.22 in T15 Variety3(Kiro-yellow) treated with 10g VAM per plant followed by 6.18 in T10 Variety2(Baltico-white) treated with 10g VAM per plant less in number recorded 4.33 in T1 Variety1(Cerventes-pink) with control.

VAM in association with plant roots is known for exploration of more soil volume thereby making the nutrients available for diffusion of phosphate ion and increasing the surface area for absorption of nutrients such as N, K, Mn and Zn (**Vijayananthan *et al*. (2007) in jasmine and Panj *et al*. (2011) in gerbera**).

Results are presented in Table:1

Floral Parameters

The results of experiment is revealed No. of days for first bud initiation from pinching less days recorded 59.11 in T8 Variety2(Baltico-white) treated with 5g VAM per plant followed by 68.55 in T15 Variety3(Kiro-yellow) treated with 10g VAM per plant more days recorded 84.9 in T6 Variety2(Baltico-white) with control. Increase in absorptive surface area of the roots due to VAM might have led to enhanced uptake and transportation of available water and nutrients like P, Zn, Fe, Mg and Cl, ultimately resulting in better sink for faster mobilization of photosynthates and early transformation of plant parts from vegetative to reproductive phase. **Pathak and Kumar (2009)** in gladiolus.

Bud diameter highest was recorded 21.72mm in T15 Variety3(Kiro-yellow) treated with 10g VAM per plant followed by 21.11mm in T10 Variety2(Baltico-white) treated with 10g VAM per plant lowest recorded 14.16mm in T1 Variety1(Cerventes-pink) with control flower diameter highest was recorded 6.16cm in T5 Variety1(Cerventes-pink) treated with 10g VAM per plant followed by 6.03cm in T15 Variety3(Kiro-yellow) treated with 10g VAM per plant lowest recorded 4.66cm in T1 Variety1(Cerventes-pink) with control vase life longer duration recorded 13.33 in T5 Variety1(Cerventes-pink) treated with 10g VAM per plant followed by 12.5 in T15 Variety3(Kiro-yellow) treated with 20g VAM per plant shorter duration recorded 7.66 in T11 Variety3(Kiro-yellow) with control.

Results are presented in Table:1

Yield Parameters

No. of flowers per plant more flowers recorded 5.74 in T15 Variety3(Kiro-yellow) treated with 10g VAM per plant followed by 5.44 in T5 Variety1(Cerventes-pink) treated with 10g VAM per plant less buds recorded 1.67 in T1 Variety1(Cerventes-pink) with control.

Mycelia network of VAM which penetrates deeply in soil, thus widening the root zone for improving the availability of P and enhancing the uptake of certain minerals (Zn and S) including P and water **Patel *et al.* (2011)** in African marigold.

Results are presented in Table:1

Conclusion

From the present investigation it is concluded that the Variety-3(Kiro-yellow) treated with 10g VAM per plant performed better for plant height, primary branches, bud diameter, yield per plant.In terms of first bud initiation Variety-2(Baltico-White) treated with 5g VAM per plant showed better performance. In terms of vase life, flower diameter Variety-1(Cerventes-pink) treated with 10g VAM per plant performed better in prayagraj conditions.

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Table:1 Response of carnation varities to vegetative parameters,floral parameters,yield parameters

Treatments	Vegetative parameters		Floral Parameters				Yield per plant
	Plant height(cm)	Primary branches	First bud initiation(days from pinching)	Bud diameter (mm)	Flower diameter (cm)	Vase life	
T_1	19.11	4.33	73.67	14.17	4.60	8.17	1.67
T_2	31.33	4.78	81.78	15.67	5.05	8.33	2.22
T_3	35.33	4.67	84.02	17.33	5.38	9.50	2.78
T_4	43.56	5.11	82.78	19.06	5.82	11.67	4.33
T_5	54.44	5.45	73.22	21.06	6.17	13.33	5.45
T_6	23.44	5.56	84.89	15.89	4.88	7.17	2.11
T_7	29.22	5.78	82.56	18.33	5.32	7.67	3.00
T_8	34.56	5.67	59.11	18.61	5.63	8.33	3.78
T_9	45.78	5.00	82.67	19.83	5.75	9.67	4.22
T_{10}	52.89	6.18	73.67	21.11	5.95	11.33	5.11
T_{11}	24.78	4.78	82.11	18.17	4.80	7.17	2.44
T_{12}	31.89	4.89	71.89	19.67	5.20	7.33	4.56
T_{13}	34.89	4.67	76.67	16.11	5.62	9.33	4.11
T_{14}	46.11	4.89	73.44	19.78	5.77	10.17	4.89
T_{15}	55.44	7.22	68.56	21.72	6.03	12.50	5.75
Factors(AXB)							
C.D.	2.92	0.93	0.79	1.93	0.15	N/A	0.55
S.Ed	1.42	0.45	0.39	0.94	0.07	0.89	0.27