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EFFECT OF MICROBIAL CONSORTIA ON GROWTH AND DEVELOPMENT OF JAMUN (*Syzygium cumini* L.) CV. GOMA PRIYANKA

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ABSTRACT : A field experiment on "Effect of microbial consortia on growth and development of Jamun (*Syzygium cumini* L.) cv. Goma Priyanka" was conducted during the year 2019-20, at the Instructional Farm, Department of Fruit Science, College of Horticulture and Forestry, Jhalawar. The experiment consisted of 10 treatments laid out in Randomized Block Design with three replications. The maximum increase in shoot parameters like rootstock girth, scion girth, plant height, number of shoots and number of leaves per plantwere recorded in T9 (M3T3)-(Azospirillum, PSB, KSB, VAM and Trichodermaharzianum) (100g) among different treatments of microbial consortia.

Keywords : *Syzygium sp., microbes, Rhizobium, rootstock, growth, development.*

The jamun (*Syzygium cumini* L. Skeels) is an important unexploited indigenous fruit of the tropics, belonging to the family myrtaceae. It has recently attained major importance as an arid zone fruit because of its hardy nature and high yielding potential. It is known by several names, such as black plum, black berry and java plum, jamun, rajamun, jambhul, kalajam, phalani and phalinda (Singh *et al.,* 9).There are several types of jamun found in India that differs in colour and size of the fruits. Two types of fruits are commonly observed, i.e., the rajamun, bearing big oblong deep purple or bluish fruits with pink greyish, juicy, sweet pulp with small stone and the khatta, bearing small fruits with acidic pulp (Anon.,1). The edible pulp forms 70 to 85 per cent of whole fruit containing 10 to 18 per cent total soluble solids, 0.14 to 2.17 per cent acidity and 83.7 per cent moisture (Daware *et al.,*2). The edible pulp also contains 0.7g protein, 0.3g fat, 0.9g crude fibre, 14.0g ash, 15mg phosphorous, 12 mg iron and 18mg vitamin C per 100g of pulp.

Biofertilizers have gone a long way and are accepted as important nutrient inputs under both integrated nutrient management strategy and organic management approach. The journey that started with *Rhizobium* has now been diversified, and many new microorganisms have been identified and are being exploited commercially as microbial inoculants. While Rhizobium, Azotobacter, Azospirillum, Phosphate solubilising biofertilizers and Mycorrhizalbiofertilizers have been accepted as regular inputs.A microbial consortium is two or more microbial groups living symbiotically. Microbial consortia have various advantages over single species, or "superbugs", such as efficiency, robustness, and modularity. Microorganisms under natural habitats live in communities and some provide benefits to plants. It is unveiled that microbes in small consortia enhance defense signaling cascades leading to enhanced transcriptional activation of several metabolic pathways (Kumar and Jagadeesh., 7).Though the performance of the plant growth promoting rhizobacter (PGPR) and its consortia has been proved to promote plant growth and enhance productivity in field condition by several strains in different crops, the use of these products has not been popular among farmers due to several reasons such as:a) lack of awareness among the farmers, b) availability and supply of quality consortia.

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MATERIALS AND METHODS

A field experiment was conducted Instructional Farm, Department of Fruit Science, College of Horticulture and Forestry, Jhalarapatan, Jhalawar in

the newly established orchard of Jamun cv. GomaPriyanka.In present experiment three types of microbial consortia symbionts with each other and have ability to survive at high temperature which prevails in Jhalawar condition were used. These microbial consortia shall be obtained from Department of Microbiology, University of Horticultural Sciences, Bagalkot, Karnataka. The experiment is laid out in randomized block design with factorial concept containing 10 treatment combinations (T_0, M_1T_1, M_1T_2, M_1T_3, M_2T_1, M_2T_2, M_2T_3, M_3T_1, M_3T_2, M_3T_3) in which M_1 containing *Azospirillum,* Phosphate solubilising biofertilizers (PSB), Potassium solubilisingbiofertilizers (KSB), M_2 containing (PSB), (KSB), and Vesicular Arbuscular Mycorrhiza(VAM) and M3 containing Azospirillum (PSB), (KSB), Vesicular Arbuscular Mycorrhiza (VAM) and *Trichodermaharzianum* and each microbial consortia . In this Each consortia had mixture of equal weight of respective microbial strainand observation were recorded from April to August.

Table 1 : Treatment details.

Treatment notation	Treatment content
T_0 (Control)	No application of Microbial consortia
T_1 (M_1T_1)	Microbial consortia 50g
T_2 (M_1T_2)	Microbial consortia 75g
T_3 (M_1T_3)	Microbial consortia 100g
T_4 (M_2T_1)	Microbial consortia 50g
T_5 (M_2T_2)	Microbial consortia 75g
T_6 (M_2T_3)	Microbial consortia 100g
T_7 (M_3T_1)	Microbial consortia 50g
T_8 (M_3T_2)	Microbial consortia 75g
T_9 (M_3T_3)	Microbial consortia 100g

Plant parameters recorded during the course of experiment are rootstock girth (mm), scion girth (mm), Plant height (cm), number of shoots per plant and number of leaves per plant was recorded initially at March later it was recorded at every two month interval till March. Rootstock girth and scion girth was measured with help of verniercaliper, plant height was recorded with help of measuring tape and number of shoots per plant and number of leaves per plant were counted manually from each plant. The data mended during the experimentation were statistically analyzedby randomized block design as suggested by Panse *et al.* (8). Data in parentheses indicate Arc sine transformed values. The variation not varying between 0 to 30 or 70 to100 were subjected to *Arc Sine* transformation.

RESULTS AND DISCUSSION

The values pertaining to rootstock girth of jamun plant due to effect of different microbial consortia at different levels are presented in Table 2. Significant differences were found at all the stage of growth of jamun plants.

With reference to the rootstock growth at the end of the experiment the maximum increase (10.52%) in rootstock girth was noticed in T_9 (M_3T_3)-(*Azospirillum*, PSB, KSB, VAM and *Trichoderma harzianum*) (100g). It was significantly superior over all other treatments. However, T_9 (M_3T_3)-(*Azospirillum,* PSB, KSB, VAM and *Trichoderma harzianum*) (100g) at the end of experiment during March, was found at par with T_8 (M_3T_2)-(*Azospirillum*, PSB, KSB, VAM and *Trichoderma harzianum*) (75g) (10.31%).The minimum increase at the time of final observation during March in rootstock girth (3.53%) was noted in T_0 (Control) treatment.

It is evident from the data (Table 2) that the different microbial consortia at different levels had significant influence on per cent increase in scion girth.The observation indicated that the maximum scion girth (8.24%) was recorded in T_9 (M_3T_3)-(*Azospirillum*, PSB, KSB, VAM and *Trichoderma harzianum*) (100g)and it was found significantly superior over the other treatments which was found to be statistically at par with T_8 (M_3T_2)-(*Azospirillum*, PSB, KSB, VAM and *Trichoderma harzianum*) (75g) recording (8.01%). Whereas, minimum (3.13) per cent increase in scion girth was recorded in T_0 (Control).

A perusal of data in Table 2 reveals that plant height of jamun plant cv. GomaPriyanka increased with advancement of growth period on all the days of observations from March 2019 to March 2020 after application of different treatments of microbial consortia. The rate of percentage increase(7.11%) in plant height was found maximum under T_9 (M_3T_3) -(*Azospirillum*, PSB, KSB, VAM and *Trichoderma harzianum*) (100g) treatment. This treatment was at par (6.90%) with T_6 (M_2T_3)-(*Azospirillum*, PSB, KSB, VAM) (100g) and T_8 (M_3T_2)-(*Azospirillum*, PSB, KSB, VAM and *Trichoderma harzianum*) (75g) recording (6.68%). The minimum per cent increase in plant height (2.14%) was recorded at control.

The data on number of shoots per plant as influenced by different microbial consortia at different level is presented in Table 2. A keen observation of the data reveals that microbial consortia significantly influenced number of shoots per plant. The treatment T_9 (M_3T_3)-(*Azospirillum,* PSB, KSB, VAM and

Trichoderma harzianum) (100g) had significantly maximum number of shoots (58.38%) which was statistically at par with T_8 (M_3T_2)-(*Azospirillum*, PSB, KSB, VAM and *Trichoderma harzianum*) (75g) (57.67%) while, the minimum number of shoots (33.20%) was recorded in control.

The data regarding number of leaves per plant Table 2 revealed that there was significant difference among the various treatments. It was observed that the maximum percent increase in number of leaves per plant (21.76%) was recorded in T_9 (M_3T_3)-(*Azospirillum*, PSB, KSB, VAM and *Trichoderma harzianum*) (100g) fallowed by T_8 (M_3T_2)-(*Azospirillum*, PSB, KSB, VAM and *Trichoderma harzianum*) (75g) recording 19.12%. The minimum (11.24%) increase was recorded in T_0 (Control).

Table 2 : Effect of microbial consortia on rootstock girth (mm), Scion girth, Plant height, Number of shoots per plant and Number of leaves per plant of Jamun cv. GomaPriyanka during growth period, 2019-20.

Treatments	Rootstock Girth	Scion Girth	Plant Height	Number of Shoots per Plant	Number of Leaves per Plant
T_0 (Control)	48.43 (3.53)	42.95 (3.13)	205.76 (2.14)	15.6 (33.20)	506.90 (11.24)
T_1 (M_1T_1)	49.01 (7.57)	40.34 (4.62)	182.3 (3.81)	17.73 (48.74)	475.97 (16.38)
T_2 (M_1T_2)	49.83 (7.69)	45.56 (5.78)	197.99 (5.14)	18.06 (53.62)	488.22 (16.80)
T_3 (M_1T_3)	51.37 (8.79)	45.4 (6.27)	207.61 (6.14)	29.57 (55.54)	571.00 (17.08)
T_4 (M_2T_1)	45.7 (8.17)	37.93 (5.80)	213.19 (3.84)	18.18 (49.50)	585.78 (16.85)
T_5 (M_2T_2)	46.45 (8.50)	40.76 (5.90)	188.66 (5.33)	21.42 (54.07)	521.84 (17.04)
T_6 (M_2T_3)	48.68 (9.61)	41.9 (7.08)	214.28 (6.90)	29.64 (56.68)	564.33 (19.00)
T_7 (M_3T_1)	50.16 (8.76)	44.18 (6.15)	202.02 (4.87)	23.49 (49.97)	496.15 (18.96)
T_8 (M_3T_2)	52.85 (10.31)	43.97 (8.01)	215.82 (6.68)	17.68 (57.67)	609.79 (19.12)
T_9 (M_3T_3)	53.05 (10.52)	46.24 (8.24)	197.55 (7.11)	26.64 (58.38)	461.81 (21.76)
(CD = 0.05)	0.23	0.35	0.58	0.96	0.18

Note :

1. Data in parentheses indicate Arc sine transformed values. The variation not varying between 0 to 30 or 70 to100 were subjected to *Arc Sine* Transformation
2. CD has been calculated based on percentage value.
3. M_1- (*Azospirillum*, PSB, and KSB), T_1 (50g), T_2 (75g) and T_3 (100g).
   M_2- (*Azospirillum*, PSB, KSB and VAM), T_1 (50g), T_2 (75g) and T_3 (100g).
   M_3-(*Azospirillum,* PSB, KSB, VAM and *Trichoderma harzianum*), T_1 (50g), T_2 (75g) and T_3 (100g).

Data as regard to the effect of microbial consortia in shoot parameters like rootstock girth, scion girth, plant height, number of shoots and number of leaves per plant are presented in Table 2. The maximum percentage increase in shoot parameters like rootstock girth, scion girth, plant height, number of shoots and number of leaves per plant were recorded in T_9 (M_3T_3) -(*Azospirillum,* PSB, KSB, VAM and *Trichoderma harzianum*) (100g) among the treatments of microbial consortia.Better shoot parameters under this treatment over other treatments may be due to the higher effectivity of this treatment in improvement of rhizosphere microorganisms providing all the macro and micro nutrients required for growth and developments of plants. The effect of this treatment comparatively better over other treatments may also be explained in the background of better improvement of physico-chemical properties of the soil due to moderation of pH and EC, enrichment of the organic carbon, N, P, K status of the soil as reflected in the result also besides probably due to increased release of growth factors like auxins, gibberellins and cytokinin in root zone.

Several workers have reported an increase in overall growth of fruit tree due to application of consortia of different plant growth promoting rhizobacters (PGPR) (Dutta and Kundu (3) in mango; Goswami *et al.* (5) in guava cv. Pant Prabhat; Godage *et al.* (4) in cv. Sardar guava and Hazarika *et al.* (6) in banana cv. Grand Naine).

CONCLUSION

The maximum percentage increase in shoot parameters like rootstock girth, scion girth, plant height, number of shoots and number of leaves per plant were

recorded in T_9 (M_3T_3) -(*Azospirillum*, PSB, KSB, VAM and *Trichoderma harzianum*) (100g)respectively. From the present investigation, it may be concluded that application of microbial consortia containing the different plant growth promoting rhizobacters there was significant increase in plant parameters.

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