



E-ISSN: 2278-4136

P-ISSN: 2349-8234

www.phytojournal.com

JPP 2020; 9(4): 1950-1952

Received: 04-05-2020

Accepted: 06-06-2020

Ravindra Kumar Meena

Department of Fruit Science,
College of Horticulture and
Forestry, Agriculture University,
Kota, Jhalrapatan, Jhalawar,
Rajasthan, India

Prerak Bhatnagar

Department of Fruit Science,
College of Horticulture and
Forestry, Agriculture University,
Kota, Jhalrapatan, Jhalawar,
Rajasthan, India

Jitendra Singh

Department of Fruit Science,
College of Horticulture and
Forestry, Agriculture University,
Kota, Jhalrapatan, Jhalawar,
Rajasthan, India

Rahul Chopra

Department of Natural Resource
Management, College of
Horticulture and Forestry,
Agriculture University, Kota,
Jhalrapatan, Jhalawar,
Rajasthan, India

Hem Raj Chhipa

Department of Basic Science,
College of Horticulture and
Forestry, Agriculture University,
Kota, Jhalrapatan, Jhalawar,
Rajasthan, India

Corresponding Author:**Ravindra Kumar Meena**

Department of Fruit Science,
College of Horticulture and
Forestry, Agriculture University,
Kota, Jhalrapatan, Jhalawar,
Rajasthan, India

Correlation dynamics among growth, development and soil parameters in response to Vermicompost and PSB on Jamun cv. Goma Priyanka in Vertisols of Jhalawar district

**Ravindra Kumar Meena, Prerak Bhatnagar, Jitendra Singh, Rahul
Chopra and Hem Raj Chhipa**

Abstract

Correlation studies were determined among growth, development and soil parameter of Jamun plants in response to use of different treatment combinations of Vermicompost and PSB during June to December 2019 at Instructional Farm, Department of Fruit Science at College of Horticulture and Forestry, Jhalawar. The growth and development attributes viz. rootstock girth, scion girth, plant height, number of leaves per shoot, number of shoot per branch, number of nodes, canopy spread, length of internodes, leaf width, petiole length, leaf area and chlorophyll exhibited significant and positive correlation with each other. Correlation studies are very important statistical measures to interpret the uptake of nutrient dynamics and inter-relationships amongst morphometric, developmental and soil health status under present investigations conducted on Jamun cv. Goma Priyanka plants.

Keywords: Rootstock girth, scion girth, plant height, number of nodes, leaf area, chlorophyll

Introduction

Jamun (*Syzygium cumini* Skeels.) is an indigenous minor fruit of India. It belongs to the family Myrtaceae. Jamun is commonly known as jamun, jaman, duhat (Hindi), jambolan and black plum, Indian black berry, Jambolan plum, Java plum, Malabar plum and Portuguese plum in English (Sharma *et al.*, 2012) [6]. The plant of Jamun is a large evergreen tree up to 30 m height, bark pale brown, slightly rough on old stems, leaves opposite, simple, entire, elliptic to broadly oblong, smooth, glossy, somewhat leathery, 7.5-15.0 cm long, short pointed at tips. Flowers white 7.5-13 mm across in branched clusters at stem tips, calyx cuplike, 4 petals, fused into a cap, many stamens. Fruit variability in jamun size ranges up to 2.5 cm long ellipsoid or oblong, crowned with truncate calyx limb, black with pink-juicy pulp (Sharma *et al.*, 2012) [6]. The edible pulp of plant forms 75 per cent of the whole fruit. Jamun fruit contains various minerals and vitamins like Ca, Mg, P, Fe, Na, K, Cu, S, Cl, vitamin C, vitamin A, riboflavin, nicotinic acid and folic acid. Glucose and fructose are the principle sources of sweeteners in ripe fruit with no trace of sucrose. Maleic acid is the major acid (0.59 % of the weight of fruit). Small quantity of oxalic acid has also been reported. Tannins mainly Gallic acid governs the astringency activity due to its efficiency to combine with tissues and proteins and precipitate them. Vermicompost is a product derived from the accelerated biological degradation of organic wastes by earthworms and microorganisms. The end product, commonly referred to as vermicompost is greatly humified through the fragmentation of the parent organic materials by earthworms and colonization by microorganisms (Edwards and Neuhouser, 1988) [1]. Phosphorus (P) is a major growth-limiting nutrient, and unlike the case for nitrogen, there is no large atmospheric source that can be made biologically available (Ezawa *et al.*, 2002) [2]. Root development, stalk and stem strength, flower and seed formation, crop maturity and production, N-fixation in legumes, crop quality, and resistance to plant diseases are the attributes associated with phosphorus nutrition. Although microbial inoculants are in use for improving soil fertility during the last century, however, a meager work has been reported on P solubilization in Jamun crop under vertisols. Soil microorganisms play a key role in soil P dynamics and subsequent availability of phosphate to plants (Richardson, 2001) [5].

Materials and Methods

The experimental entitled "Effect of vermicompost and PSB on growth and development of Jamun (*Syzygium cumini* L.) cv. Goma Priyanka"

was conducted during duration June to December 2019 at the Instructional Farm, Department of Fruit Science, College of Horticulture and Forestry, Jhalawar. The application of vermicompost and PSB treatments were applied during first week of June, 2019 with the help of spade after thorough mixing in the active root zone of 2.5 year old plants. The twenty treatments combinations were: T₀ (Basal dose of N.P.K), T₁ (1.5 kg vermicompost/plant), T₂ (3kg vermicompost/plant), T₃ (4.5 kg vermicompost/plant), T₄ (6 kg vermicompost/plant), T₅ (25 g PSB/plant), T₆ (50 g PSB/plant), T₇ (75 g PSB/plant), T₈ (1.5kg vermicompost+25g PSB/plant), T₉ (1.5 kg vermicompost + 50g PSB/plant), T₁₀ (1.5 kg vermicompost + 75g PSB/plant), T₁₁ (3.0 kg vermicompost + 25g PSB/plant), T₁₂ (3.0 kg vermicompost + 50g PSB/plant), T₁₃ (3.0 kg vermicompost + 75g PSB/plant), T₁₄ (4.5 kg vermicompost + 25g PSB/plant), T₁₅ (4.5 kg vermicompost + 50g PSB/plant), T₁₆ (4.5 kg vermicompost + 75g PSB/plant), T₁₇ (6.0 kg vermicompost + 25g PSB/plant), T₁₈ (6.0 kg vermicompost + 50g PSB/plant), T₁₉ (6.0 kg vermicompost + 75g PSB/plant). The experiment was laid in randomized block design with three replications. The RDF was applied in all the treatments including control. The present investigations were undertaken at Fruit Instructional Farm, College of Horticulture and Forestry, Jhalawar on 2.0 years old plants of Jamun cv. Goma Priyanka planted at spacing of 6 X 6 meter under square system of planting. The total number of plants included in the experiment was 60. All the selected Jamun plants were selected on the basis of uniformity in growth and at par vigour. All the treatment combinations were applied in first week of June 2019. Plant parameters are recorded at two months interval. Correlation analysis was done after completion of all plant growth and soil parameters and subsequently data were analyzed for multiple correlations as suggested by Panse and Sukhatme (1985)^[5].

Results and Discussion

1. Correlation among growth and development attributes

The results presented in table -1. indicated that rootstock girth exhibited significant and positive correlation with scion girth ($r = 0.487^*$), plant height ($r = 0.499^*$), number of leaves per shoot ($r = 0.642^{**}$), number of shoots per branch ($r = 0.804^{**}$), number of nodes ($r = 0.795^{**}$), canopy spread ($r = 0.563^{**}$), length of internodes ($r = 0.826^{**}$), leaf width ($r = 0.517^*$), petiole length ($r = 0.579^{**}$), leaf area ($r = 0.749^{**}$) and chlorophyll content ($r = 0.719^{**}$).

The attribute scion girth exhibited significant and positive correlation with rootstock girth ($r = 0.487^*$), number of leaves per shoot ($r = 0.607^{**}$), number of shoots per branch ($r = 0.640^{**}$), number of nodes ($r = 0.713^{**}$), length of internodes ($r = 0.647^{**}$), leaf width ($r = 0.607^{**}$), petiole length ($r = 0.650^{**}$) and leaf area ($r = 0.793^{**}$). The results of present findings are in conformity with those reported by Lokesh *et al.*, (2020) in guava in most of the growth and development attributes.

The attribute plant height enumerated significant and positive correlation with rootstock girth ($r = 0.499^*$), number of leaves per shoot ($r = 0.625^{**}$), number of shoots per branch ($r = 0.671^{**}$), number of nodes ($r = 0.685^{**}$), canopy spread ($r = 0.942^{**}$), length of internodes ($r = 0.703^{**}$), leaf width ($r = 0.481^*$) and leaf area ($r = 0.585^{**}$).

The attribute number of leaves per shoot bore significant and positive correlation with rootstock girth ($r = 0.642^*$), scion

girth ($r = 0.607^{**}$), plant height ($r = 0.625^{**}$), number of shoots per branch ($r = 0.873^{**}$), number of nodes ($r = 0.785^{**}$), canopy spread ($r = 0.671^{**}$), length of internodes ($r = 0.870^{**}$), leaf width ($r = 0.760^{**}$), petiole length ($r = 0.535^*$) and leaf area ($r = 0.827^{**}$).

The attribute number of shoots per branch exhibited significant and positive correlation with rootstock girth ($r = 0.804^{**}$), scion girth ($r = 0.640^{**}$), plant height ($r = 0.671^{**}$), number of leaves per shoot ($r = 0.873^{**}$), number of nodes ($r = 0.910^{**}$), canopy spread ($r = 0.760^{**}$), length of internodes ($r = 0.931^{**}$), leaf width ($r = 0.634^{**}$), petiole length ($r = 0.659^{**}$), leaf area ($r = 0.797^{**}$) and chlorophyll content ($r = 0.632^{**}$).

The attribute number of nodes reflected significant and positive correlation with rootstock girth ($r = 0.795^{**}$), scion girth ($r = 0.713^{**}$), plant height ($r = 0.685^{**}$), number of leaves per shoot ($r = 0.785^{**}$), number of shoots per branch ($r = 0.910^{**}$), canopy spread ($r = 0.738^{**}$), length of internodes ($r = 0.915^{**}$), leaf width ($r = 0.726^{**}$), petiole length ($r = 0.675^{**}$), leaf area ($r = 0.819^{**}$) and chlorophyll content ($r = 0.625^{**}$).

The attribute canopy spread exhibited significant and positive correlation with rootstock girth ($r = 0.563^{**}$), plant height ($r = 0.942^{**}$), number of leaves per shoot ($r = 0.671^{**}$), number of shoots per branch ($r = 0.760^{**}$), number of nodes ($r = 0.738^{**}$), length of internodes ($r = 0.775^{**}$), leaf width ($r = 0.498^*$), petiole length ($r = 0.468^*$), leaf area ($r = 0.579^{**}$) and chlorophyll content ($r = 0.511^*$).

The attribute length of internodes determined significant and positive correlation with rootstock girth ($r = 0.826^{**}$), scion girth ($r = 0.647^{**}$), plant height ($r = 0.703^{**}$), number of leaves per shoot ($r = 0.870^{**}$), number of shoots per branch ($r = 0.931^{**}$), number of nodes ($r = 0.915^{**}$), canopy spread ($r = 0.775^{**}$), leaf width ($r = 0.754^{**}$), petiole length ($r = 0.685^{**}$), leaf area ($r = 0.864^{**}$) and chlorophyll content ($r = 0.620^{**}$).

The attribute leaf width revealed significant and positive correlation with rootstock girth ($r = 0.517^*$), scion girth ($r = 0.607^{**}$), plant height ($r = 0.481^*$), number of leaves per shoot ($r = 0.760^{**}$), number of shoots per branch ($r = 0.634^{**}$), number of nodes ($r = 0.726^{**}$), canopy spread ($r = 0.498^*$), length of internodes ($r = 0.754^{**}$) and leaf area ($r = 0.730^{**}$).

The attribute petiole length exhibited significant and positive correlation with rootstock girth ($r = 0.579^{**}$), scion girth ($r = 0.650^{**}$), number of leaves per shoot ($r = 0.535^*$), number of shoots per branch ($r = 0.659^{**}$), number of nodes ($r = 0.675^{**}$), canopy spread ($r = 0.468^*$), length of internodes ($r = 0.685^{**}$), leaf area ($r = 0.661^{**}$) and chlorophyll content ($r = 0.657^{**}$).

The attribute leaf area exhibited significant and positive correlation with rootstock girth ($r = 0.749^{**}$), scion girth ($r = 0.739^{**}$), plant height ($r = 0.585^{**}$), number of leaves per shoot ($r = 0.827^{**}$), number of shoots per branch ($r = 0.797^{**}$), number of nodes ($r = 0.819^{**}$), canopy spread ($r = 0.579^{**}$), length of internodes ($r = 0.864^{**}$), leaf width ($r = 0.730^{**}$) and petiole length ($r = 0.661^{**}$).

The attribute chlorophyll content revealed significant and positive correlation with rootstock girth ($r = 0.719^{**}$), number of shoots per branch ($r = 0.632^{**}$), number of nodes ($r = 0.625^{**}$), canopy spread ($r = 0.511^*$), length of internodes ($r = 0.620^{**}$) and petiole length ($r = 0.657^{**}$).

Table 1: Correlation among growth and development parameters in response to Vermicompost and PSB in Jamun cv. Goma Priyanka

	Root Stock girth	Scion girth	Plant height	No. of leaves per shoot	No. of shoots per branch	No. of nodes	Canopy volume	Length of Internodes	Leaf Width	Petiole Length	Leaf Area	Chlorophyll content
Root Stock girth	1.00	0.487*	0.499*	0.642**	0.804**	0.795**	0.563**	0.826**	0.517*	0.579**	0.749**	0.719**
Scion girth	0.487*	1.00	0.42	0.607**	0.640**	0.713**	0.42	0.647**	0.607**	0.650**	0.793**	0.33
Plant height	0.499*	0.42	1.00	0.625**	0.671**	0.685**	0.942**	0.703**	0.481*	0.35	0.585**	0.40
No. of leaves per shoot	0.642**	0.607**	0.625**	1.00	0.873**	0.785**	0.671**	0.870**	0.760**	0.535*	0.827**	0.41
No. of shoots per branch	0.804**	0.640**	0.671**	0.873**	1.00	0.910**	0.760**	0.931**	0.634**	0.659**	0.797**	0.632**
No. of nodes	0.795**	0.713**	0.685**	0.785**	0.910**	1.00	0.738**	0.915**	0.726**	0.675**	0.819**	0.625**
Canopy volume	0.563**	0.42	0.942**	0.671**	0.760**	0.738**	1.00	0.775**	0.498*	0.468*	0.579**	0.511*
Length of Internodes	0.826**	0.647**	0.703**	0.870**	0.931**	0.915**	0.775**	1.00	0.754**	0.685**	0.864**	0.620**
Leaf Width	0.517*	0.607**	0.481*	0.760**	0.634**	0.726**	0.498*	0.754**	1.00	0.37	0.730**	0.14
Petiole Length	0.579**	0.650**	0.35	0.535*	0.659**	0.675**	0.468*	0.685**	0.37	1.00	0.661**	0.657**
Leaf Area	0.749**	0.793**	0.585**	0.827**	0.797**	0.819**	0.579**	0.864**	0.730**	0.661**	1.00	0.44
Chlorophyll content	0.719**	0.33	0.40	0.41	0.632**	0.625**	0.511*	0.620**	0.14	0.657**	0.44	1.00

* Correlation is significant at the 5 % level of significance

** Correlation is significant at the 1% level of significance

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