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RESEARCH ARTICLE

Influence of P-solubilizers, enriched compost and IBA on shoot parameters and N, P content in leaves of pomegranate (*Punica granatum* L.) cuttings

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SUMMARY

An experiment was conducted under green house condition at the Department of Agricultural Microbiology, UAS, GKVK, Bangalore during 2004-2005 to study the effect of P-solubilizers and enriched compost on rooting and growth of pomegranate (*Punica granatum* L.) cuttings. The cuttings inoculated with *Pseudomonas fluorescens* @ 5 g per kg of pot mixture integrated with enriched compost were recorded significantly early sprouting (5.5 day after planting (DAP), maximum sprout length (18.37 cm, 36.23 cm and 71.71 cm at 30, 60 and 90 DAP, respectively) and also higher percentage of phosphorus (0.31%) and nitrogen (0.74%) were found in the leaves of sprouted cuttings as compared to rest of the treatments. From the results it can be concluded that P-solubilizers along with enriched compost have influenced on growth and other parameters as against synthetic growth regulators.

Key Words : P-solubilizers, Enriched compost, IBA, Cuttings, Rooting, Growth

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India signing to WTO agreement has changed the scenario of Indian agriculture in general and horticulture in particular, with increased impetus to face global competitiveness in productivity and quality. Genuine planting or seed material is of immense importance, particularly for fruit crops, to realize maximum returns. India is the largest pomegranate fruit producer in the world, with about 50 per cent of the world's production and 5 per cent of the total international pomegranate Trade (Raina, 2004).

Some of the microorganisms are known to produce several growth regulating substances having beneficial effects on plant growth and development processes, including cell division, cell elongation and root proliferation. Applications of P-solubilizing microorganisms influences nutrient uptake and growth of plants by producing bio-active compounds and solubilizing phosphorus from insoluble sources, also fix atmospheric nitrogen.

The application of enriched compost enhances the soil health and also supports the plant growth by providing nutrients. Hence, study was carried out to know the effect of P-solubilizers and enriched compost on rooting and growth of pomegranate (*Punica granatum* L.) cuttings.

MATERIALS AND METHODS

The present investigation was under taken at the Department of Agricultural Microbiology, University of Agricultural Sciences, GKVK, Bangalore, under greenhouse condition during 2004-2005.

Different types of P-solubilizers *viz.*, *Bacillus megaterium*, *Bacillus subtilis* and *Pseudomonas fluorescens* were multiplied on King's Broth for 10 days. The fully grown culture when attained a population of 10^8 cells per ml then it

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was mixed with pre-sterilized neutralized lignite powder and applied to polybags at the rate of 5 g per kg pot culture. The dried sieved enriched compost was collected from Organic Matter Decomposition Scheme, Department of Agricultural Microbiology, University of Agricultural Sciences, G.K.V.K., Bangalore.

Soil, sand and enriched compost were taken at the ratio of 2:1:1 and they were mixed thoroughly. For control treatment, only soil and sand were mixed at the ratio of 2:1. For IBA check treatment only sand was used and for enriched compost treatment 2:1 compost and sand mixture was used. The polybags were filled with pot mixture upto 2.5 cm below the rim. The filled polybags of the above mixture were arranged in replication and treatments wise in the greenhouse.

The IBA solution of 500 ppm concentration were prepared from 1000 ppm stock solution by taking 250 ml and volume made upto 500 ml with distilled water. Properly matured pencil sized thick shoots with active and well developed buds were cut from the Ganesh pomegranate variety. The cuttings of about 20-25 cm in length with at least 4-6 live buds were prepared for planting.

Microbial inoculants were weighed aseptically and inoculated in the potting mixture according to the treatments. Prepared 500 ppm IBA solution was taken in beaker and the cuttings were dipped in the solution such that a lower 2 cm portion was immersed in the solution for the period of 1 minute. After planting regular watering was done and pots were kept free from weeds upto 90 days. After 90 days of planting the cuttings were uprooted carefully from polybags on 90th day after planting (DAP) washed thoroughly under running water and adhering sand, soil particles were removed. The following observations were taken.

Upto 90th DAP :

– Days taken for sprouting

– Length of sprouts at 30, 60 and 90th DAP

After 90 DAP :

– Fresh and dry weight of shoot

–Estimation of nitrogen by micro Kjeldhal method

–Estimation of phosphorus by Vanado-molybdate method.

RESULTS AND DISCUSSION

The data revealed from experiment on shoot parameters recorded in Table 1 and nutrient content of N, P in sprouted leaves of pomegranate cuttings are presented in Table 2.

Among the different treatments, the cuttings treated with *P. fluorescens* @ 5 g per kg of pot mixture integrated with enriched compost produced early sprouting (5.5 day after

Table 1: Influence of P–solubilizers, enriched compost and IBA on shoot parameters of pomegranate (Ganesh) cuttings

Treatments	Days taken for first sprout of cuttings	Sprout length (cm)			Fresh wt. (g) cutting	Dry wt. (g) cutting
		30 DAP	60 DAP	90 DAP		
T_1-control	8.85	12.89	25.89	52.45	35.14	17.91
T_2 – IBA @ 500 ppm (check)	7.53	12.20	20.46	32.05	23.72	11.41
T_3 -Enriched compost	8.16	13.17	27.07	54.23	36.33	18.52
T_4 – IBA @ 500 ppm + Enriched compost	7.06	15.94	30.60	60.72	40.68	20.33
T_5- *Bacillus subtilis* + Enriched compost	5.85	18.09	35.93	71.01	47.64	23.75
T_6- *Bacillus magaterium* + Enriched compost	5.85	17.99	36.00	71.04	47.83	23.91
T_7- *Pseudomonas flourescens*+ Enriched compost	5.50	18.37	36.23	71.71	48.29	24.02
S.E. ±	0.16	0.30	0.38	0.40	0.55	0.26
C.D. (P=0.05)	0.47	0.87	1.13	1.20	1.63	0.77

Table 2 : Influence of P–solubilizers, enriched compost and IBA on nutrient concentration in leaves of sprouted pomegranate (Ganesh) cuttings

Treatments	N conc (Per cent)	P conc (Per cent)
T_1-control	0.22	0.13
T_2 – IBA @ 500 ppm (check)	0.11	0.06
T_3 -Enriched compost	0.28	0.19
T_4 – IBA @ 500 ppm + Enriched compost	0.36	0.20
T_5- *Bacillus subtilis* + Enriched compost	0.66	0.28
T_6- *Bacillus magaterium* +Enriched compost	0.68	0.29
T_7-*Pseudomonas flourescens*+Enriched compost	0.74	0.31
S.E.±	0.010	0.01
C.D. (P=0.05)	0.031	0.036

planting). Earliness in sprouting of these cuttings might be due to the microbial inoculants which enhances the plant growth by producing growth promoting substances like gibberellins and stored food material also contribute to considerable extent. These results are in close agreement with findings of Varny and Fiker (1984).

Maximum sprout length (18.37 cm, 36.23 cm and 71.71 cm at 30, 60 and 90 DAP, respectively) of cuttings were produced in cuttings treated with *P. fluorescens* @ 5 g per kg of pot mixture integrated with enriched compost. The increase in height of sprout is due to the beneficial effect of plant growth hormones produced by P-solubilizers. The results are in conformity with the findings of Jones and Sreenivasa (1992).

Application of enriched compost also increases the sprout length by supplying essential nutrients, which were required for plant growth these results are in corroborate with the findings of Sikora and Enkiri (1999). Higher shoot fresh weight (48.29 g) and dry weight (24.02 g) per cutting were recorded in cuttings inoculated with *P. fluorescens* @ 5 g per kg of pot mixture along with enriched compost. This might be due to increased vegetative growth. The present findings are in close agreement with the findings made by Walley and Germida (1997).

The higher percentage of phosphorus (0.31%) and nitrogen (0.74%) were found in the leaves of sprouted cuttings treated with *P. fluorescens* @ 5 g per kg of pot mixture integrated with enriched compost. This might be due to better availability of nutrients in the enriched compost and solubilization of unavailable organic phosphate by phosphate solubilizing microorganisms. Similar observations were also reported by Dubey (1996). Similarly cuttings treated with P-solubilizers also recorded maximum amount of nitrogen than other treatments. Since, some of the P-solubilizers are also able to fix atmospheric nitrogen. This is in line with findings of Chan *et al.* (1994).

From the results it can be concluded that P-solubilizers along with enriched compost have influenced on growth and development of pomegranate cuttings as against the synthetic growth regulators.

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