

## Effect of Foliar Application of Organic Growth Promoters on Grading and Quality of Potato (*Solanum tuberosum* L.)

Ashvin S. Gajbhiye<sup>1\*</sup>, Arun S. Kadam<sup>2</sup>, Dnyaneshwari R. Veer<sup>1</sup>, Pallavi N. Puram<sup>3</sup> and Arjun V. Khote<sup>1</sup>

<sup>1</sup>M.Sc. Student, Department of Horticulture, College of Agriculture, Latur, V.N.M.K.V., Parbhani (Maharashtra), India.

<sup>2</sup>Professor, Department of Horticulture, College of Agriculture, Latur, V.N.M.K.V., Parbhani (Maharashtra), India.

<sup>3</sup>M.Sc. Student, Department of AHDS, College of Agriculture, Latur, V.N.M.K.V., Parbhani (Maharashtra), India.

(Corresponding author: Ashvin S. Gajbhiye\*)

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**ABSTRACT:** This experiment was investigated in P.G. Laboratory, Department of Horticulture, College of Agriculture, Latur (MH) India, to study the effect of foliar application of organic growth promoters on grading and quality of potato during 2019-20. Total eleven treatments of five organic growth promoters at two concentrations viz., Control (T<sub>1</sub>), Panchgavya 3% (T<sub>2</sub>), Panchgavya 5% (T<sub>3</sub>), Vermiwash 3% (T<sub>4</sub>), Vermiwash 5% (T<sub>5</sub>), Cow Urine 3% (T<sub>6</sub>), Cow Urine 5% (T<sub>7</sub>), Amritpani 3% (T<sub>8</sub>), Amritpani 5% (T<sub>9</sub>), Jeevamrit 3% (T<sub>10</sub>), Jeevamrit 5% (T<sub>11</sub>). The preparation of these OGP had a challenge to collect the organic sample and make on time. The maximum A grade tubers yield (4.90 t/ha) was recorded in the treatment T<sub>2</sub>. Whereas B grade tubers (4.61 t/ha) was recorded in the treatment T<sub>3</sub>. The T<sub>9</sub> produced highest yield (3.34 t/ha) of C grade tubers and the last but not least, the T<sub>5</sub> produced maximum yield (2.82 t/ha) of D grade tuber. Regarding the quality highest TSS (5.24°Bx), maximum reducing sugars (0.53 %), maximum total sugars (0.63 %) and maximum starch contains (14.53 %) were recorded in the treatment T<sub>3</sub>. Thus, superior quality potato tubers with higher grades, the application of above treatments were found beneficial under Marathwada region of Maharashtra State.

**Keywords:** Organic growth promoters, Panchgavya, Vermiwash, Cow Urine, Amritpani, Jeevamrit, Potato, Grades and Quality.

### INTRODUCTION

Potato as a vegetable is of great importance in our daily diet. Most important and useful member of the Solanaceae family with chromosome number  $2n=4x=48$ . It is grown in tropical as well as in subtropical areas during cool and dry seasons. The cultivated potato (*Solanum tuberosum* L.) is originated in the Andean high lands of South America. In a potato tuber, about 80 % is water and the rest is dry matter. The complex carbohydrates, starch grains, are stored as a reserve material inside this tissue. Starch is the major component of the dry matter accounting for approximately 70 % of the total solids. The potato can be distinguished from cereals like rice and wheat for its higher capacity to produce dry matter, which is about 47.6 kg/hectare/day. The average raw material composition of a potato tuber is as follows: dry matter (20 %), starch (12-18.2 %), total sugars (0-2 %), protein (2 %), fibre (0.5 %), lipids (0.1 %), vitamin A (trace/100 g fresh weight), vitamin C (31 mg/100 g fresh weight), minerals (trace), ash (1-1.5 %), amylose (22-25 %) and glycoalkaloids (< 1 mg/100 g fresh weight) as an antinutritional factor. Potato proteins are comparable to eggs and milk therefore superior to those present in cereals, pulses or vegetables. Potato is in

maximum uses for making potato flour, potato chips, French fries, frozen potato, potato starch and tapioca of potato.

The total area and production in India is 1786.2 thousand ha and 49344.03 tonnes respectively. In India UP ranks 1<sup>st</sup>, West Bengal 2<sup>nd</sup> and Maharashtra ranks 9<sup>th</sup> and 11<sup>th</sup> in area and production respectively. It is one of the important vegetable crop in Maharashtra, the area is 13.0 thousand ha with production 529.25 tonnes and share 1.07% (Anon, 2018).

The increasing trend of abundant use of inorganic fertilizers along with herbicides, pesticides and exploiting available water resources etc. has poses a great threat to sustainability of our agro-ecosystem. On the other hand, uptake of nutrients by potato is quite high due fast, rapid, early growth and tuber formation. Organic agriculture is beneficial not only in term of case of production and also the quality of harvested produce. Organic farming system is gaining lot of importance on account of hazardous effects of chemical farming system. So, organic manures, bio-pesticides, biofertilizers and bio-growth promoters must be used either alone or in judicious combination to maintain soil, crop environment and human health. In present agricultural system possess a great threat to the

sustainability of our agro-ecosystem under such situation it is essential to look for alternatives which are effective and eco-friendly. Reviews of current trends in organic practices have reported improved yield in crops in rainfed areas of India, especially in drought years (Singh *et al.*, 2001; Ramesh *et al.*, 2005).

Vermiwash is liquid manure contains phytohormones like auxins and cytokinins. According to Zambare *et al.* (2008), it contains nitrogen fixing bacteria such as *Azotobacter* sp., *Agrobacterium* sp., and *Rhizobium* sp. (Jagtap *et al.*, 2013). Panchgavya is an organic formulation made from cow goods. Consequences of panchgavya application are superior growth, yield and quality of crops. It provides micronutrients, essential micronutrients many vitamins, required amino acid, growth promoting substances for plants well growth (Vimalendran and Wahab 2013). In ancient Ayurveda cow urine has been greatly mentioned for its pharmacological importance. It contains 95% water, 2.5% urea, and the remaining 2.5% a mixture of salts, hormones, enzymes, and minerals (Jandaik *et al.*, 2015). Jeevamrit soil microorganisms play an active role in soil fertility as they involve in the cycle of nutrients like carbon and nitrogen, which are required for plant growth. They are responsible for the decomposition of the organic matter entering the soil and therefore in the recycling of nutrients in soil (Devarinti, 2016). There has been little scientific documentation of yield and nutrient improvement from the use of these organic growth promoters on vegetable crops.

## MATERIAL AND METHODS

This experiment was carried out at P.G. Laboratory, Department of Horticulture, College of Agriculture, Latur, V.N.M.K.V., Parbhani (MH) to study the effect of foliar application of different organic growth promoters on grading and quality of potato during 2019-20. The variety Kufri Pukhraj was used for this experiment. The experiment laid out in Randomized Block Design with eleven treatments and three replications. The different organic growth promoters such as Panchgavya, Vermiwash, Cow Urine, Amritpani and Jeevamrit at 3% and 5% were sprayed

on 30, 45 and 60 DAP. Statistical analysis of the observations recorded in the experiment was undertaken by adopting standard statistical methods as per Panse and Sukhatme (1985).

## RESULTS AND DISCUSSION

**Effect of different organic growth promoters in potato on A grade tubers (>75 g).** The significant differences were observed among all the treatments of organic growth promoters for this character. The maximum A grade tubers yield (4.90 t/ha) was recorded in the treatment Panchgavya 3% (T<sub>2</sub>) and statistically at par with T<sub>10</sub> and T<sub>11</sub>. While, the minimum A grade tubers (0.65 t/ha) was observed in the Control (T<sub>1</sub>) treatment from Table 1.

These results are also in line with those of Ravichandran *et al.* (2011) who also reported that the number of A grade tubers was significantly increased by the application of panchgavya.

**Effect of different organic growth promoters in potato on B grade tubers (51-75 g).** The data pertaining in Table 1, the maximum yield of B grade tubers (4.61 t/ha) was recorded in the treatment of application of Panchgavya 5% (T<sub>3</sub>) which was significantly more than the rest of the treatments. The minimum yield of B grade tubers (0.89 t/ha) was observed with the application of Cow urine 5% (T<sub>7</sub>).

**Effect of different organic growth promoters in potato on C grade tubers (25-50 g).** The data from Table 1 showed that, the foliar application of Amritpani 5% (T<sub>9</sub>) produced highest yield (3.34 t/ha) of C grade tubers, which was statistically at par with the T<sub>7</sub> and T<sub>6</sub>. The lowest C grade tuber yield (0.49 t/ha) was recorded in the Panchgavya 5% (T<sub>3</sub>) treatment.

**Effect of different organic growth promoters in potato on D grade tubers (<25 g).** Data clearly revealed that from Table 1 the application of Vermiwash 5% (T<sub>5</sub>) produced maximum yield (2.82 t/ha) of D grade tuber which was significantly superior over rest of the treatments. The next maximum D grade tuber yield (2.79 t/ha) was recorded in the treatment Control (T<sub>1</sub>). The minimum (0.15 t/ha) D grade tuber yield was observed in the treatment Panchgavya 5% (T<sub>3</sub>).

**Table 1: Effect of different organic growth promoters in potato on grade wise tuber yield (t/ha).**

Tr. No.	Treatments	Grade wise tuber yield (t/ha)				Total Yield (t/ha)
		A (>75 g)	B (51-75 g)	C (25-50 g)	D (<25 g)	
T <sub>1</sub>	Control (5%)	0.65(10.00)	1.00(15.50)	2.04(31.44)	2.79(43.05)	6.48
T <sub>2</sub>	Panchgavya (3%)	4.90(48.66)	2.04(20.27)	1.93(19.14)	1.20(11.93)	10.06
T <sub>3</sub>	Panchgavya (5%)	2.76(34.46)	4.61(57.54)	0.49(6.13)	0.15(1.87)	8.01
T <sub>4</sub>	Vermiwash (3%)	3.34(39.04)	3.87(45.24)	0.79(9.26)	0.55(6.45)	8.55
T <sub>5</sub>	Vermiwash (5%)	1.59(22.74)	1.37(19.58)	1.23(17.51)	2.82(40.18)	7.01
T <sub>6</sub>	Cow Urine (3%)	2.30(31.56)	1.45(19.92)	2.93(40.24)	0.60(8.28)	7.29
T <sub>7</sub>	Cow Urine (5%)	0.81(11.17)	0.89(12.26)	3.26(45.12)	2.27(31.45)	7.23
T <sub>8</sub>	Amritpani (3%)	3.12(35.41)	3.72(42.26)	1.17(13.29)	0.80(9.05)	8.80
T <sub>9</sub>	Amritpani (5%)	1.60(21.99)	1.91(26.29)	3.34(45.96)	0.42(5.76)	7.26
T <sub>10</sub>	Jeevamrit (3%)	4.85(48.11)	2.52(25.00)	1.60(15.88)	1.11(11.02)	10.09
T <sub>11</sub>	Jeevamrit (5%)	4.52(48.81)	2.44(26.28)	1.49(16.07)	0.82(11.02)	9.27
S.E.(m) ±		0.20	0.23	0.14	0.07	
C.D. at 5%		0.59	0.70	0.41	0.21	

\* Figures in parentheses indicate the per cent of graded yield.

The proportion and activity of beneficial microbes would be at the higher rate in panchgavya which helps in synthesis of growth promoting substances that might have increased the yields (Waheeduzzama *et al.*, 2007). The finding corroborates those of Vajantha *et al.* (2014), who reported that by the application of panchgavya showed highest percentage high grade produce in Ashwagandha.

**Effect of different organic growth promoters in potato on Total Soluble Solids ( $^{\circ}$ Brix).** The data clearly showed that from Table 2 no significant differences were observed with respect to TSS contents of tubers produced under influence of different treatments of organic growth promoters. However, the foliar application of Panchgavya 5% ( $T_3$ ) recorded highest TSS (5.24 $^{\circ}$ Bx) value. While, the lowest (4.76 $^{\circ}$ Bx) TSS was observed in the tubers of Control ( $T_1$ ) treatment.

**Effect of different organic growth promoters in potato on Reducing Sugars (%).** There were significant differences in reducing sugars contents of tubers produced among all the treatments. The maximum reducing sugars (0.53 %) was recorded in the treatment Panchgavya 5% ( $T_3$ ) which was at par with  $T_{11}$ ,  $T_2$ ,  $T_8$ ,  $T_{10}$  and  $T_4$ . The minimum reducing sugars (0.41 %) was obtained in the control ( $T_1$ ) treatment showed in Table 2.

**Effect of different organic growth promoters in potato on Total Sugars (%).** As regards to the total sugars, significant variations were observed in all the treatments studied. However, the maximum total sugars (0.63 %) was recorded in the treatment Panchgavya 5% ( $T_3$ ) which was at par with  $T_{11}$ ,  $T_2$  and  $T_{10}$  while, the minimum total sugar (0.55 %) was observed in the Control ( $T_1$ ) treatment from Table 2.

**Effect of different organic growth promoters in potato on Starch (%).** Data clearly revealed that from Table 1, there were no significant differences in starch contains of tubers produced by different treatments of organic growth promoters. However the maximum starch contains (14.53 %) was recorded in the treatment Panchgavya 5% ( $T_3$ ) which was followed by  $T_{11}$  and  $T_2$ . The minimum starch content (13.68 %) was recorded in the tubers of Control ( $T_1$ ) treatment.

This may be due to effect of panchgavya contains materials like milk provides fat, protein, carbohydrates, amino acid and calcium. Curd provides lactobacillus which act as catalyst in the digestion of organic waste. Ghee provides vitamin A & B, calcium and fat. These contains stimulate the quality of vegetable crops (Rakesh *et al.*, 2017).

These results are also in line with those of Gopakkali and Sharanappa (2014) who reported that the application panchgavya and vermiwash improved the quality of onion (*Allium cepa*).

**Table 2: Effect of different organic growth promoters in potato on quality attributes of potato.**

Tr. No.	Treatments	TSS ( $^{\circ}$ Bx)	Reducing sugars (%)	Total sugars (%)	Starch (%)
$T_1$	Control (5%)	4.76	0.41	0.55	13.68
$T_2$	Panchgavya (3%)	5.21	0.52	0.60	14.37
$T_3$	Panchgavya (5%)	5.24	0.53	0.63	14.53
$T_4$	Vermiwash (3%)	5.12	0.48	0.57	13.83
$T_5$	Vermiwash (5%)	5.04	0.47	0.57	13.81
$T_6$	Cow Urine (3%)	4.78	0.44	0.56	13.76
$T_7$	Cow Urine (5%)	4.88	0.45	0.56	13.78
$T_8$	Amritpani (3%)	5.17	0.49	0.58	14.06
$T_9$	Amritpani (5%)	4.97	0.46	0.56	13.79
$T_{10}$	Jeevamrit (3%)	5.18	0.49	0.59	14.14
$T_{11}$	Jeevamrit (5%)	5.23	0.52	0.61	14.48
S.E.(m) $\pm$		0.48	0.02	0.01	0.85
C.D. at 5%		NS	0.05	0.04	NS

## CONCLUSION

In nutshell, it can be concluded that, for getting high grading of yield with superior quality of potato tubers, the foliar application of organic growth promoters *viz.*, Panchgavya @ 3% and Panchgavya @ 5% at 15 days of interval to potato crop while it on field was found beneficial. Further, it can also be concluded that Amritpani @ 5% and Vermiwash @ 5% may be consider as alternative sources for supply of nutrients for increasing the grade and quality of potato tubers. These Organic Growth Promoter prepared very cheaply and will also helpful for increases the production of tubers.

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**Conflict of Interest.** The authors have not affirmed any conflict of interest.

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