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# Impact of bio-fertilizers and fertilizers on potato (*Solanum tuberosum* L.) cv. Kufri Pukhraj and Kufri Jyoti cultivation

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#### Abstract

A field experiment was conducted to study the effect of foliar fertilization of zinc and manganese on growth and yield potential of potato at the experimental farm, School of Agriculture, Lovely Professional University, Phagwara during winter season of 2017- 18. The experiment was laid out in a Randomized Complete Block Design (RCBD) with three replications. There were ten treatments used in which one control and remaining treatment consists combination of fertilizer and biofertilizers. Growth parameters were plant height, leaf number while yield parameters were tuber weight, and tuber yield were recorded. Application of different bio-fertilizers alone or in combination with others as seed, soil and foliar spray revealed that the bio-fertilizers have stimulatory effect studied growth parameter of potato. The highest tuber weight and tuber yield with treatment T9 using (T6 + biofertilizer; Azotobacter and phosphate solubilizing bacteria). The results showed that the application of different bio fertilizer along with fertilizers revealed significant positive impact on plant height, number of leaves, tuber weight and yield of potato.

**Keywords:** Plant height, leaves, tuber weight, potato

#### Introduction

Potato (*Solanum tuberosum* L.) has a place with solanaceae family, is very popular and important vegetable grown in all over world. It is the fourth important crop after maize, wheat and rice <sup>[1]</sup>. Nitrogen, phosphorus and potassium are the significant supplements influencing development, improvement and yield of potato. Nitrogen being constituent of cellular material improves chlorophyll union. The phosphorus directly affects shoot development, root advancement and tuber arrangement in potato while, potassium is one of the vital constituent of cell and its lack has unfavourable impact on nature of tuber. There are numerous natural wellsprings of nitrogen, phosphorus and potassium among them Farm Yard Manure (FYM) is generally prominent. It contains 0.5% nitrogen, 0.2% phosphorus and 0.5% potassium and numerous different micronutrients <sup>[2]</sup>. Exceptional returns must be maintained through the use of ideal NPK measurements in adjusted extent.

Biofertilizers are living life forms utilized as a part of the preparation of soil and are helpful in supplementing the typical use of substance manures and help in improving the soil <sup>[3]</sup>. Soil microorganisms assume an imperative part in change of supplement for plant utilize. On the off chance that the microorganisms are absent in sufficient sum in soil, they must be vaccinated by utilizing bio fertilizers. There are basically two kinds of biofertilizers i.e. nitrogen settling bio fertilizers and phosphatic bio fertilizers. Nitrogen settling biofertilizers add nitrogen to the dirt by diminishing environmental nitrogen and phosphatic biofertilizers can solubilize the phosphates bound in soil and builds its accessibility in plant. To build the creation and nature of potato, sensible blend of natural wellsprings of supplement alongside inorganic and biofertilizers (azotobacter, phosphobacteria) get great reaction <sup>[4]</sup>.

One of the significant worries in this day and age is the contamination and tainting of soil with the utilization of abundance substance manures and pesticides. Natural nitrogen and phosphorus, ecologically benevolent manures creatures, for example, microscopic organisms, growths and cyanobacteria might be considered as the watchword for taking care of such issue. Thus, this may upgrade plant supplements take-up and advance plant development <sup>[5]</sup>. Bio fertilization is presently a critical technique for giving the plants their healthful necessities without undesirably affecting the earth <sup>[5]</sup>.

Moreover, there is presently a quickly developing interest for naturally developed nourishment items (for both the neighborhood and fare markets), which helps in the quick spreading of natural and bio-farming all finished numerous nations, particularly the creating nations of the southern half of the globe [6]. The goal of this examination was to research the impact of chosen business nitrogen and phosphorus bio-manures on potato development, quality and yield of two potato cultivars under various conditions. The consequences of this work may help in improving the development and nature of potato tuber and expanding its yield.

### Material and Methods

The experiment was conducted at the experimental Farm of the Department of Agriculture, Lovely Professional University, Jalandhar, Punjab (India) during 2017-18. The latitude 31° 22'31.81"N and 75°23'03.02 E longitude with altitude of 252 m above sea level, which falls under the central plain zone of Agra climate zone of Punjab. The soil was sandy loam with pH 7.7. The available N, P and K content of soil were 224, 14.8 and 272.4 kg ha<sup>-1</sup>, respectively with organic carbon 0.55% and electrical conductivity 0.28 (dSm<sup>-1</sup>).

The experiment was laid out in randomized complete block design with three replications. There were 10 treatments, (T1- 60% dose of N,P,K, T2- 80% dose of N,P,K T3-100% dose of N,P,K, T4- T1+tuber soaked in 1% urea, T5- T2+tuber soaked in 1% urea, T6- T3+tuber soaked in 1% urea, T7- T4+biofertilizer, T8- T5+biofertilizer, T9- T6+biofertilizer and T10- Absolute control). The potato variety kufri pukhraj and kufri jyoti were used in this research work. Potato tubers were planted with spacing of 20.0 cm plant to plant distance while 60.0 cm apart from row to row in the November 2017. Quantifiable examination was finished by grasping fitting procedure for examination of variance as portrayed by Fisher [7].

### Result and Discussion

The highest value (71.85) of number of leaves in variety kufri jyoti was recorded in treatment T8 (T5 + biofertilizer) and found to be statistically significant over the other treatments. The lowest number of leaves (63.57) was recorded in control (Table 1.0). The highest value (74.46) of number of leaves in variety kufri jyoti was recorded in treatment T8 (T5 +

biofertilizer) and found to be statistically significant over the other treatments. The lowest number of leaves (64.09) was recorded in control (Table 1.0).

The highest plant height (60.94 cm) in variety kufri jyoti was recorded in treatment T8 (T5 + biofertilizer) and found to be statistically significant over the other treatments. The lowest number of leaves (43.49 cm) was recorded in control. The highest plant height (63.80 cm) in variety kufri jyoti was recorded in treatment T8 (T5 + biofertilizer) and found to be statistically significant over the other treatments. The lowest number of leaves (44.67 cm) was recorded in control (Table 1.0). Taller plants recorded in biofertilizers (PSB and Azotobacter) under the present study may be due to effect of Azotobacter which is a group of bacteria which are free living nitrogen fixer. The mechanism by which the plants, inoculated with Azotobacter, derive possible benefits in terms of increased plant growth [8].

The highest value (254.26 g) of tubers weight in variety kufri jyoti was recorded in treatment T9 (T6+Biofertilizer) followed by treatment T7 (T4+Biofertilizer) i.e.252.9. The lowest weight of tubers (141.03g) was recorded in T4. The highest value of weight of tubers (249.99g) in variety kufri pukhraj was recorded in treatment T9 (T6+Biofertilizer) followed by treatment T4(T1+Tuber Soaked in 1% urea) i.e.246.49. The lowest of weight of tubers (135.65g) was recorded in T3 (Table 1.0). This is mainly due to more bulking rate of tubers. These results are in line with the findings of [9] who reported progressive increase in the seed size tuber yield with the application of NPK fertilizers at the higher rates to potato seed crop.

The highest value of yield per hectare (18.3 t/ha) in variety kufri jyoti was recorded in treatment T9 (T6+Biofertilizer) followed by treatment T7 (T2+Tuber Soaked in 1% urea) i.e.18.2. The lowest of yield per hectare (9.77) was recorded in T3. The highest value (18.31t/ha) of yield per hectare in variety kufri pukhraj was recorded in treatment T9 (T6+ biofertilizer) followed by treatment T7 (T4+Biofertilizer) i.e.18.21. The lowest yield per hectare (10.16 t/ha) was recorded in T3 (Table 1.0). The above results are in close conformity with the findings obtained by [4], also recorded the application of crop residue incorporation with biofertilizers (PSB + Azotobacter) which produced the highest total tuber yield (286.63 q/ha) in potato. Similar results were also reported by Verma *et al.* [10] in potato.

**Table 1:** Effect of Biofertilizers (PSB + Azotobacter) on different parameters at 60 days in potato variety kufri jyoti and kufri Pukhraj

Treatments	Number of leaves		Plant height (cm)		Tuber Weight (g)		Yield Per Hectare (t/ha)		
	Kufri Jyoti	Kufri Pukhraj	Kufri Jyoti	Kufri Pukhraj	Kufri Jyoti	Kufri Pukhraj	Kufri pukhraj	Kufri jyoti	
T1	60% dose of N,P,K	66.9	65.7	46.8	45.8	176.6	171.4	12.7	12.3
T2	80% dose of N,P,K	65.8	66.9	55.7	56.7	252.4	244.3	18.2	17.6
T3	100% dose of N,P,K	65.5	66.4	45.6	48.2	143.1	135.7	10.3	9.8
T4	T 1+tuber soaked in 1% urea	67.9	68.2	47.8	48.0	141.0	145.8	10.2	10.5
T5	T 2+tuber soaked in 1% urea	64.2	65.5	44.3	45.2	241.2	246.5	17.4	17.7
T6	T 3+tuber soaked in 1% urea	66.3	67.9	47.1	48.5	141.3	137.1	10.2	9.9
T7	T 4+ biofertilizer (Azotobacter and PSB)	65.6	67.3	56.2	57.3	252.9	214.1	18.2	15.4
T8	T 5+ biofertilizer (Azotobacter and PSB)	71.8	74.5	60.9	63.8	234.9	233.5	16.9	16.8
T9	T 6+ biofertilizer (Azotobacter and PSB)	67.4	66.6	49.3	46.7	254.26	250.0	18.3	18.0
T10	control	63.6	64.1	43.5	44.7	157.1	139.1	11.3	10.0
	Grand Mean	66.5	67.3	49.7	50.5	199.5	191.7	14.4	13.8
	C.D. @ 5%	1.0	0.8	0.9	0.7	10.6	14.9	0.1	0.0
	SE(m)	0.3	0.3	0.3	0.2	3.6	5.0	0.0	0.0
	SE(d)	0.5	0.4	0.4	0.3	5.0	7.0	0.0	0.0
	C.V.	0.9	0.7	1.1	0.8	3.1	4.5	0.3	0.2

### Conclusion

It can be concluded that combined inoculation of potato tuber with Azotobacter and PSB showed significantly higher plant

height, number of leaves, tuber weight and tuber yield, as compare to other treatments. So, these two bio fertilizers (Azotobacter and PSB) along with normal doses of major

other fertilizers like N,P and K may be recommended to the potato growers to get higher yields and to prevent losses and to increase the overall production of potato. In this way, Azotobacter plays healthful stimulatory and remedial part for the advantage of yield, which makes it a potential bio-manure for potato. Likewise PSB solubilises phosphorus from soil source and makes it accessible to plant.

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