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Response of weed management practices on yield, nutrients uptake of potato and soil health

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Abstract

The present investigation entitled “*Response of weed management practices on yield, nutrients uptake of potato and soil health*” carried out at Main Experiment Station, Vegetable Farm of Acharya Narendra Deva University of Agriculture and Technology, Kumarganj, Ayodhya (U.P.) during Rabi season 2019-2020. The experiment was laid out in Randomized Block Design with three replications. There were eight treatments viz., T1 control (Recommended dose of N: P₂O₅ K₂O @ 150:100:120 kg ha⁻¹), T2 (T1+Eucalyptus leaf @ 5t/ha), T3 (T1+Mahua leaf @ 5t/ha), T4 (T1+Rice straw @ 5t/ha), T5 (T1+Water hyacinth @ 5 t/ha), T6 (T1 + Neem leaf @ 5t/ha), T7 (T1+Metribuzin @ 0.35 kg/ha PE), T8 (T1+ Two hand weeding at 20 and 40 DAS). The soil of the experimental field was silt loam in texture, having Ph 8.2, organic carbon 3.1 g/kg, available N 142 kg/ha, available P 14.9 kg/ha, available K 241.0 kg/ha and available Zn 0.41 ppm. The potato variety Kufri Neelkanth was shown on 16/11/2019 at spacing 60 cm x 20 cm. Leaf mulches (Eucalyptus, Mahua, Rice straw, water hyacinth and neem @ 5t/ha and Metribuzin @ 0.35 kg/ha PE (pre emergence) were applied as per treatment. Among the various weed control measure, water hyacinth @ 5t/ha was found better to increase the yield nutrients uptake of potato and soil health and economics of potato.

Keywords: Potato, weed management nutrients uptake, soil health

Introduction

The total area in the world under the potato cultivation is 19.303 million ha⁻¹ and total production is 388.191 million tones ha⁻¹ with 20.11 tones productivity. Whereas India, total area is 1.845 million ha⁻¹ and production 50.34 m tones with productivity of 27.32 tha⁻¹. The contribution of U.P. alone in area production and productivity is 0.615 million ha⁻¹, 13.7 million tones and 22.7 tha⁻¹, respectively Anonymous (2019-2020). Adoption of green revolution technologies involving greater use of synthetic agrochemicals such as fertilizers and pesticides with high yielding varieties of crops have increased the production output per hectare. The productivity of Potato in eastern Uttar Pradesh is very low which might be due to the non-adoption of cropping system, poor irrigation, weed management practices and soil health. Weed reduce wheat yield it not controlled in the critical stages of crop and may cause yield reduction up to 60%. Mulching has smothering effects on weeds by restricting the photosynthesis. It is effective against annual weed and some perennial weeds. Mulching with leaf straw material when applied on soil surface does not allow weeds to germinate as light does not reach in the soil. Mulches not only ensure moisture but impact beneficial effect like suppression of extreme fluctuations of soil temperature, reduce water loss through evaporation, decomposition of leaf straw resulting more stored soil moisture and improve soil health (Bhullan *et al.*, 2015). Therefore different weed management strategies were evaluated for managing the yield, nutrients uptake and soil health.

Materials and Methods

The present investigation entitled Response of weed management practices on yield, nutrients uptake of potato and soil health was carried out at Main Experiment Station, Vegetable Farm of Acharya Narendra Deva University of Agriculture and Technology, Kumarganj, Ayodhya (U.P.) during Rabi season 2019-2020. The experiment was laid out in Randomized Block Design with three replications. There were eight treatments viz., T1 control (Recommended dose of N: P₂O₅ K₂O @ 150:100:120 kg ha⁻¹), T2 (T1+Eucalyptus leaf @ 5t/ha), T3 (T1+Mahua leaf @ 5t/ha), T4 (T1+Rice straw @ 5t/ha), T5 (T1+Water hyacinth @ 5 t/ha), T6 (T1 + Neem leaf @ 5t/ha), T7 (T1+Metribuzin @ 0.35 kg/ha PE), T8 (T1+ Two hand weeding at 20 and 40 DAS).

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The soil of the experimental field was silt loam in texture, having Ph 8.2, organic carbon 3.1 g/kg, available N 142 kg/ha, available P 14.9 kg/ha, available K 241.0 kg/ha and available Zn 0.41 ppm. The potato variety Kufri Neelkanth was sown on 16/11/2019 with spacing 60 cm x 20 cm. Leaf mulches (Eucalyptus, Mahua, Rice straw, water hyacinth and neem @ 5t/ha and Metribuzin @ 0.35 kg/ha PE (pre emergence) were applied as per treatments.

Result and Discussion

Tuber and haulm yield (t/ha)

The maximum tuber yield (36.90 t/ha) were recorded under T₅ (water hyacinth applied @ 5t/ha) which was significantly superior over control and at par with rest of the treatments. No significant variation was observed within the treatments. Minimum tuber yield (24.50 t/ha) was observed under control. Among different weed management practices, water hyacinth @ 5t/ha followed by straw mulch @ 5t/ha and neem leaf @ 5t/ha produced the better yield (potato tuber and haulm) as compared with other mulching treatments. Metribuzin PE @ 0.35 kg/ha and two hand weeding also produced better yield and it was *at par* with water hyacinth (5 t/ha) treatment. Weed management practices which contributed to better growth parameters and yield attributes. Better vegetative growth coupled with higher yield attributes resulted in higher tuber yield over control. Besides these, mulching provides very low degree of crop weed competition for light, moisture and nutrients. Due to less number of weeds, the potato crop received congenial condition for the proper growth Kaur *et al.*

Table 1: Effect of different treatments on tuber yield

Treatments	Tuber Yield (t/ha)
T ₁ Control	24.50
T ₂ Eucalyptus leaf @ 5.0t/ha	35.60
T ₃ Mahua leaf @ 5.0t/ha	35.70
T ₄ Rice straw @ 5.0t/ha	35.72
T ₅ Water Hyacinth @ 5.0t/ha	36.90
T ₆ Neem leaf @ 5.0t/ha	35.70
T ₇ Metribuzin @ 0.35t/ha	36.32
T ₈ Hand weeding (2)	36.85
SEm+	0.93
C.D. at 5%	2.80

Nutrient uptake by potato

The uptake of nutrients (N, P, K and Zn) by potato as affected by the various treatments has been presented in Table 2. It is evident from the data that uptake of N, P, K and Zn increased significantly with the application in different treatments. Among various treatments maximum uptake of N (126.90 kg/ha), P (33.40 kg/ha), K (159.75 kg/ha) and Zn (1440.25 g/ha) were observed with T₅ treatment (water hyacinth @ 5t/ha) which was significantly superior over control.

However, minimum uptake of nutrients N (69.50 kg/ha), P (14.26 kg/ha), K (89.70 kg/ha) and Zn (843.20 g/ha) were observed in control plot, respectively.

Weed management through mulching play a major role to maintain soil health due to build up of soil organic matter, increase of beneficial microbes, improvement in physical properties of soil and nutrients availability. (Doring *et al.*, 2005) [6]. Incorporation of various mulching treatments significantly increased the nutrients content and uptake (N, P, K and Zn) in potato tuber and haulm over control. Among various mulching practices, maximum nutrient content and uptake content were found under T₅ treatment (water hyacinth @ 5t/ha) followed by Rice-straw @ 5t/ha, Neem leaf @ 5t/ha, Mahua leaf @ 5t/ha and Eucalyptus leaf @ 5t/ha. Better nutrients content and uptake might be due to suitable mulching effect which enhanced very low degree of crop weed competition for light, moisture and nutrients. Ultimately nutrients availability, better growth and activity of root development. The increased availability of nutrients means more translocation of nutrients from soil to plants. Overall increase in uptake of all these nutrients might be due to the cumulative effect of improvement in their concentration in plant tissue. The results are in agreement with those of Verma *et al.* (2011) [4].

Soil Health

Available N, P, K and Zn

Available N, P, K and Zn of soil have been presented in Table2. Maximum available N (147.92 kg ha⁻¹), P (15.72 kg ha⁻¹), K (247.0 kg ha⁻¹) and Zn (0.52 ppm) were recorded in T₅ (water hyacinth was applied @ 5t/ha). While minimum available nutrients were observed under control. Available nutrients (N P K and Zn) in soil was slightly higher in mulching treatments over no mulching plots.

Among mulching treatment maximum available nitrogen and zinc were recorded under T₅ (water hyacinth applied @ 5t/ha) which was significantly superior over control and without mulching treatments and statistically at par with rest of the treatments. This was mainly due to increase in nutrients availability in to the soil and due to mulching practices. Mulches contain organic matter and organic matter is a key component of soils affecting their physical chemical and biological properties and is important source of energy and nutrients for soil ecosystem.

Maintenance of sufficient and good quality of organic matter in soil is prerequisite for sustainable and high production of crops (Doring and Kumar *et al.*, 2007). Available phosphorus and potassium did not show any significant increase with the application of treatments. This might be mainly due to less decomposition of mulching material during short duration of crop. This incorporates the findings of Kumar *et al.* (2011) [7] and Barche *et al.* (2015) [1].

Table 2: Effect of different treatments on nutrients N, P, K (kg ha⁻¹) and Zn (g ha⁻¹) uptake by potato and Available nutrients N, P, K (kg ha⁻¹) and Zn (ppm) in soil

Treatments	Nutrients uptake				Available nutrients			
	N	P	K	Zn	N	P	K	Zn
T ₁	69.50	14.26	89.70	843.20	139.50	14.70	240	0.41
T ₂	112.15	24.60	139.22	1300.35	146.42	15.35	242	0.44
T ₃	112.35	27.80	144.25	1310.00	146.50	15.30	242	0.45
T ₄	114.35	27.76	146.22	1341.82	146.50	15.50	245	0.45
T ₅	126.90	33.40	159.75	1440.25	147.92	15.72	247	0.52
T ₆	117.31	28.95	150.70	1405.31	146.70	15.55	245	0.46
T ₇	111.85	24.20	140.75	1350.14	142.50	15.00	241	0.41

T ₈	113.27	24.50	142.22	1326.46	141.50	15.00	241	0.42
SEm+	4.90	0.82	4.32	34.84	1.31	0.34	2.64	0.033
C.D. at 5%	14.88	2.49	13.10	105.68	3.98	1.03	8.03	0.100

Table 3: Effect of different treatment on soil properties

Treatments	Bulk density (Mg m ⁻³)	pH	EC (dSm ⁻¹)	Bacteria
T ₁	1.43	8.10	0.22	30.20
T ₂	1.41	8.00	0.21	33.00
T ₃	1.40	8.00	0.21	35.20
T ₄	1.40	7.90	0.21	36.40
T ₅	1.40	7.90	0.20	37.70
T ₆	1.40	7.95	0.21	37.50
T ₇	1.42	8.10	0.22	28.50
T ₈	1.42	8.10	0.22	31.70
SEm+	0.007	0.14	0.001	1.78
C.D. at 5%	0.02	NS	NS	5.40

Among different treatments minimum bulk density (1.40 Mg m⁻³), pH (7.9), EC (0.20 dSm⁻¹) and maximum bacterial population (37.70 cfu/g) were recorded under T₅ treatment (Water hyacinth 5 t ha⁻¹) while maximum bulk density, pH, EC and minimum bacterial population under control plot. The significant improvement in bacterial population of the soil with the application of mulching treatment might be due to effectiveness of mulches in the improvement of physical, chemical and biological properties of the soil and providing good environment to plant. Also production of organic matter in soil that is a good source of food for microorganism. These results also corroborated with the findings of Barche *et al.* (2015)^[1].

Conclusion

Among different weed management practices water hyacinth @ 5 t/ha was found most effective for increasing yield, nutrient uptake of potato and improving soil health.

References

1. Barche S, Nair R, Jain PK. Published review entitled Mulching on Vegetable crops production. *Eco. Env. & Cons* 2015;21(2):859-866. ISSN 0971-765 X.
2. Kaur R, Kaur C, Kaur T. Weed management through vice straw mulching and herbicide in maize *IJWS* 2020;52(1):82-88.
3. Islam MR, Nahar BS. Effect of organic farming on nutrient uptake and quality of potato. *Journal of Environmental Science & Natural Resources* 2012;5(2):219-214.
4. Verma SK, Asati BS, Tamrakar SK, Nanda HC, Gupta CR. Effects of organic components on growth, yields and economics returns in potato. *Potato Journal* 2011;38:51-55.
5. Broschat TK. Effect of mulch type and fertilizer placement on weed growth and soil pH and nutrient content. *Hort Technology* 2007;17:174-177.
6. Doring TF, Brandt M, Hesz J, Finckh MR, Sauck H. Effect of straw mulch on soil nitrate dynamics, weed, yield and soil erosion in organically grown potatoes. *Field Crops Res* 2005;94:238-249.
7. Kumar Manoj, Baishaya LK, Ghosh DC, Gupta VK. Yield and quality of potato tubers as influenced by nutrients sources under rainfed condition of Meghalaya. *Indian Journal of Agronomy* 2011;56:260-266.