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**Devesh Pathak**  
Department of Soil Science and  
Agricultural Chemistry, Acharya  
Narendra Deva University of  
Agriculture and Technology,  
Kumarganj, Ayodhya, Uttar  
Pradesh, India

**VedPrakash**  
Professor and Head Soil Science  
and Agricultural Chemistry,  
Acharya Narendra Deva  
University of Agriculture and  
Technology, Kumarganj,  
Ayodhya, Uttar Pradesh, India

**Shubhanshu Singh**  
Department of Agronomy,  
Acharya Narendra Deva  
University of Agriculture and  
Technology, Kumarganj,  
Ayodhya, Uttar Pradesh, India

**Corresponding Author:**  
**Devesh Pathak**  
Department of Soil Science and  
Agricultural Chemistry, Acharya  
Narendra Deva University of  
Agriculture and Technology,  
Kumarganj, Ayodhya, Uttar  
Pradesh, India

## Effect of weed management practices on yield, nutrients uptake and available nutrients in potato under partially reclaimed soil

Devesh Pathak, VedPrakash and Shubhanshu Singh

### Abstract

The present investigation entitled “Effect of weed management practices on yield, nutrients uptake and available nutrients in potato under partially reclaimed soil” 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: P<sub>2</sub>O<sub>5</sub> K<sub>2</sub>O @ 150:100:120 kg ha<sup>-1</sup>), 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 sown 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 mulches, water hyacinth @ 5t/ha was found better on yield nutrients uptake and available nutrients in Soil.

**Keywords:** potato, weed management and mulching

### Introduction

Potato is one of the most efficient food crop, which produce more dry matter, dietary fibre, quality protein, mineral and vitamin per unit area than wheat, maize and rice. Potato contains approximately 20.6% carbohydrate, 2.1% protein, 0.3% fat, 1.1% crude fibre, 0.9% ash and a good amount of essential amino acids like leucine, tryptophane and isoleucine etc. Potato can be compared only with rice, wheat and maize for its contribution toward securing the food, nutrition, avoiding poverty and hunger specially in developing countries, where food is perpetually on demand to feed increasing population living with inherent social and political conflict. 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) <sup>[10]</sup>. Therefore, different weed management strategies were evaluated for managing the weed spectrum with higher efficacy for sustainable potato production and soil health.

### Materials and Methods

The present investigation entitled “Effect of weed management practices on yield, nutrients uptake and available nutrients in potato under partially reclaimed soil” 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: P<sub>2</sub>O<sub>5</sub> K<sub>2</sub>O @ 150:100:120 kg ha<sup>-1</sup>), 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 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 treatment.

## Result and Discussion

### Tuber and haulm yield (t/ha)

The data pertaining to haulm and tuber yield of potato have been presented in Table 1 the critical examination of data clearly revealed that all the mulching treatments resulted significant increase in the potato tuber and haulm yields as compared to control. The maximum tuber and haulm yield (36.90 and 63.98 t/ha, respectively) were recorded under T<sub>5</sub> (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 and haulm yield (24.50 and 39.60 t/ha, respectively) 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. The above findings might be attributes to adequate 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 and development and also enhanced the availability of nutrients. The similar results have been reported by Chethan *et al.* (2019) [5] and Kaur *et al.* (2020) [4].

**Table 1:** Effect of different treatments on tuber and haulm yield

Treatments	Yield (t/ha)	
	Tuber	Haulm
T <sub>1</sub> Control	24.50	39.60
T <sub>2</sub> Eucalyptus leaf @ 5.0t/ha	35.60	61.23
T <sub>3</sub> Mahua leaf @ 5.0t/ha	35.70	61.40
T <sub>4</sub> Rice straw @ 5.0t/ha	35.72	61.45
T <sub>5</sub> Water Hyacinth @ 5.0t/ha	36.90	63.98
T <sub>6</sub> Neem leaf @ 5.0t/ha	35.70	61.40
T <sub>7</sub> Metribuzin @ 0.35t/ha	36.32	62.50
T <sub>8</sub> Hand weeding (2)	36.85	63.38
SEm±	0.93	2.37
C.D. at 5%	2.80	7.21

### Nutrient uptake by potato

The uptake of nutrients (N, P, K and Zn) by potato as affected by the various treatments have been presented in Table-2 and illustrated in Fig. 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 T<sub>5</sub> 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.

**Table 2:** Effect of different treatments on nutrients N, P, K and Zn uptake by potato

Treatments	Nutrient uptake			
	(kg/ha)			(g/ha)
	N	P	K	Zn
T <sub>1</sub> Control	69.50	14.26	89.70	843.20
T <sub>2</sub> Eucalyptus leaf @ 5.0t/ha	112.15	24.60	139.22	1300.35
T <sub>3</sub> Mahua leaf @ 5.0t/ha	112.35	27.80	144.25	1310.00
T <sub>4</sub> Rice straw @ 5.0t/ha	114.35	27.76	146.22	1341.82
T <sub>5</sub> Water Hyacinth @ 5.0t/ha	126.90	33.40	159.75	1440.25
T <sub>6</sub> Neem leaf @ 5.0t/ha	117.31	28.95	150.70	1405.31
T <sub>7</sub> Metribuzin @ 0.35t/ha	111.85	24.20	140.75	1350.14
T <sub>8</sub> Hand weeding (2)	113.27	24.50	142.22	1326.46
SEm±	4.90	0.82	4.32	34.84
C.D. at 5%	14.88	2.49	13.10	105.68

Weed management through mulching play a major role to maintain soil health due to buildup of soil organic matter, increase of beneficial microbes, improvement in physical properties of soil and nutrients availability. 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 T<sub>5</sub> treatment (water hyacinth @ 5t/ha) followed by Rice-straw @ 5t/ha, Neem leaf @ 5t/ha, Mahua leaf @ 5t/ha and Eucalyptus leaf @ 5t/ha. The results are in agreement with those of Sharif *et al.* (2009) [9], Verma *et al.* (2011) [8] and Islam and Nahar (2012) [7].

### Available N, P, K and Zn

Available N, P, K and Zn of soil have been presented in Table 3. Maximum available N (147.92 kg ha<sup>-1</sup>), P (15.72 kg ha<sup>-1</sup>), K (247.0 kg ha<sup>-1</sup>) and Zn (0.52 ppm) were recorded in T<sub>5</sub> (water hyacinth was applied @ 5t/ha). While minimum available nutrients were observed under control.

**Table 3:** Effect of different treatments on available nutrients N, P, K (kg/ha) and Zn (ppm) in soil

Treatments	Available nutrients			
	N	P	K	Zn
T <sub>1</sub> Control	139.50	14.70	240	0.41
T <sub>2</sub> Eucalyptus leaf @ 5.0t/ha	146.42	15.35	242	0.44
T <sub>3</sub> Mahua leaf @ 5.0t/ha	146.50	15.30	242	0.45
T <sub>4</sub> Rice straw @ 5.0t/ha	146.50	15.50	245	0.45
T <sub>5</sub> Water Hyacinth @ 5.0t/ha	147.92	15.72	247	0.52
T <sub>6</sub> Neem leaf @ 5.0t/ha	146.70	15.55	245	0.46
T <sub>7</sub> Metribuzin @ 0.35t/ha	142.50	15.00	241	0.41
T <sub>8</sub> Hand weeding (2)	141.50	15.00	241	0.42
SEm±	1.31	0.34	2.64	0.033
C.D. at 5%	3.98	1.03	8.03	0.100

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 T<sub>5</sub> (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 (Kumar *et al.*, 2007)<sup>[2]</sup>. 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 Lupway *et al.* (2004)<sup>[1]</sup>, Kumar *et al.* (2007)<sup>[2]</sup>, and Barche *et al.* (2015)<sup>[3]</sup>.

### Conclusion

Thus, it may be concluded that among different weed management mulching with water hyacinth @ 5 t/ha was found most effective and suitable for controlling weeds, increasing yield, nutrients uptake and improving nutrients status in soil.

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