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Effect of weed management on nutrient utilization by chickpea and weeds under *Jatropha* based agroforestry

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Abstract
A field experiment was conducted at Research Farm, Department of Forestry, JNKVV, Jabalpur during *Rabi* season 2019-20 to find out the effect of weed management on nutrient utilization by Chickpea and weeds under *Jatropha* based Agroforestry. The experiment was laid out in a Randomized Complete Block Design (RCBD) with three replications and 12 herbicidal treatments consisted of Pendimethalin 1000 g ha^{-1}, Imazathaper 900 g ha^{-1}, Atrazin 1000 g ha^{-1}, Metribuzin 300 g ha^{-1}, Oxyflorfen 100 g ha^{-1}, Pendimethalin 500 g ha^{-1} fb Imazathaper 450 g ha^{-1}, Pendimethalin 500 g ha^{-1} fb Oxyflorfen 50 g ha^{-1}, Metribuzin 150 g ha^{-1} fb Oxyflorfen 50 g ha^{-1}, Atrazin 500 g ha^{-1} fb Metribuzin 150 g ha^{-1}, Imazathaper 450 g ha^{-1} fb Atrazin 500 g ha^{-1}, hand weeding (30 DAS) and Weedy check (control). The nutrient absorption by crop and weeds is significantly influence by different herbicidal treatments. The result revealed that there were different variations in nutrients absorption by weeds. The highest nutrient absorption by chickpea seed was observed in hand weeding (42.6: 9.22: 19.2) and minimum was in weedy check (14.3: 2.22: 7.25). The highest nutrient absorption by stover was observed in hand weeding (44.4: 10.6: 32.8) and minimum was in weedy check (23.7: 2.93: 18.2). The maximum nutrient absorption of hand weeding (87.07: 19.85: 50.48) and minimum was in weedy check (38.15: 5.16: 24.85) of total (seed + stover). Among different herbicidal treatments application of Pendimethalin 1000 g ha^{-1} was found the highest (66.37: 13.85: 42.29) and lowest was in Imazathaper 900 g ha^{-1} (49.12: 7.06: 29.:39) of total (seed + stover). Weedy check recorded significantly higher nutrient absorption of weeds *viz*., *Cynodon dactylon* (4.52: 2.40: 3.46 NPK kg ha^{-1}), *Cyperus rotundus* (3.03: 1.41: 7.41), *Medicago arabica* (24.23: 3.34: 31.33), and *Vicia sativa* (15.77: 2.57: 24.37). Hand weeding (30DAS) recorded significantly lower nutrient absorption by weeds *viz*., *Cynodon dactylon* (0.59: 0.28: 1.78), *Cyperus rotundus* (0.29: 0.11: 0.77), *Medicago arabica* (2.14: 0.30: 2.86), and *Vicia sativa* (1.46: 0.21: 2.27 K) Lower absorption of nutrient in these treatments attributed to lower weeds density and dry weight. The maximum nutrient absorption of total weeds in weedy check (47.60: 9.72: 76.67) and minimum was in hand weeding (4.48: 0.91: 7.65). Among different herbicidal treatments application of application of Imazathaper 450 g ha^{-1} fb Atrazin 500 g ha^{-1} was found the highest (21.31: 4.20: 36.51) and lowest was in Metribuzin 150 g ha^{-1} fb Oxyflorfen 50 g ha^{-1} (13.44: 3.09: 24.80).

Keywords: Weed, crop, nutrient absorption, herbicidal treatments

Introduction
Agroforestry combines trees, shrubs, forages, grasses, livestock and crops in innovative and flexible combinations tailored to the needs of the farmers. This ensures sustained availability of multiple products as direct benefits such as food, vegetables, fruits, fodder, fuel, manure, medicine, timber etc. An area of 46.70 million ha has been estimated under wastelands, which is 14.75 per cent of the geographical area of the country. Agroforestry practices are considered as most vital and potential farming system for minimizing the land degradation. It enhances soil fertility, reduce erosion and weed infestation, improve water quality, enhance biodiversity, increase aesthetics and sequester carbon. Efficient versions of Agroforestry have been developed around the world, which can be adapted to different agroclimatic conditions. Agroforestry always remain productive for the farmer and generates continuous revenue. With the shrinking per capita land availability, Agroforestry system with the integration of perennial woody trees is most suitable technology for increasing total productivity of food, fodder and fuel and thereby reducing the weed infestation risk of farming.

There are many innovative farmers who have developed or modified existing Agroforestry systems to suit local conditions. Tree Born Oil Seeds (TBO) can fit into most of these systems, contributing positively towards the overall productivity and farm income. Initial programs were mainly based on large-scale plantations of jatropha (*Jatropha curcas*) on wastelands, but seed yields proved to be limited and highly variable under low input regimes, resulting in economic unviability and limited production potential (Achten *et al*., 2014; van Eijck *et al*., 2014) [1, 10].

Chickpea (*Cicer arietinum* L.) is one of the most ancient and extensively grown pulse crops of India. In our country, it is mainly cultivated in the state of Madhya Pradesh, Maharashtra, Andhra Pradesh, Rajasthan, and Odisha. India is the largest producer of chickpea accounting to 75% of the world production. Chickpea, being slow in its early growth and short stature plant, is highly susceptible to weed competition and often considerable losses may occur if weeds are not controlled at proper time. Competition of weeds with chickpea assumes more importance as the crop is sown during post-rainy season under rainfed and dry land conditions, thus requires timely and effective weed management. Weeds compete severely with crop for nutrient, moisture, light and space and causes reduction in yield to the extent of 75% in chickpea (Chaudhary *et al.*, 2005) [3]. Nutrients are very much essential for growth and development of chickpea and these deficiency leads to decrease the crop yield. Therefore, it is necessary to know the uptake of nutrients by crop and weeds very important. Thus, this research was conducted with the objective of to study the effects of integrated weed management practices on nutrient uptake by weeds and chickpea. Chickpea also plays a main role in increasing soil fertility due to its nitrogen fixing ability. Chickpea can fix up to 140 kg N ha^{-1} in a growing period (Poonia and Pithia, 2013) [7]. It leaves substantial amount of residual nitrogen for subsequent crops and adds plenty of organic matter to maintain and improved soil health and fertility. Weed competition for qualitative growth and nutrient in general and for nitrogen in particular has been reported to be most serious factor in limiting the crop yield reported from crop weed competition studies in chickpea, weeds removed 132.2 kg nitrogen, 17.6 kg phosphours and 130.1 kg potassium ha^{-1} in unweeded control, whereas the crop could utilize only 12.4 kg nitrogen, 5.3 kg phosphours and 10.3 kg potassium ha^{-1} (Kumar, 1985) [5].

Materials and Methods

A field experiment was conducted at Research Farm Department of Forestry, JNKVV, Jabalpur during *Rabi* seasons 2019-20 to find out the effects of weed management on nutrient utilization by Chickpea and weeds under *Jatropha* based Agroforestry. The experiment was laid out in a Randomized Complete Block Design (RCBD) with three replications and 12 herbicidal treatments consisted of, Pendimethalin (38.7% CS) 1000 g ha^{-1}, Imazathaper (10% SL) 900 g ha^{-1}, Atrazin (50% WP) 1000 g ha^{-1}, Metribuzin (70% WP) 300 g ha^{-1}, Oxyflorfen (23.5% EC) 100 g ha^{-1}, Pendimethalin 500 g ha^{-1} fb Imazathaper 450 g ha^{-1}, Pendimethalin 500 g ha^{-1} fb Oxyflorfen 50 g ha^{-1}, Metribuzin 150 g ha^{-1} fb Oxyflorfen 50 g ha^{-1}, Atrazin 500 g ha^{-1} fb Metribuzin 150 g ha^{-1}, Imazathaper 450 g ha^{-1} fb Atrazin 500 g ha^{-1}, hand weeding (30 DAS) and Weedy check (control).The soil of the experimental field was silty clay loam in texture, low and high rating for available nitrogen (326 kg N ha^{-1}), phosphorus (23.99 kg P_2O_5 ha^{-1}) and potassium (136 kg K_2O ha^{-1}), respectively. The soil was found slightly alkaline (pH 7.7) in reaction. Chickpea JG-12 variety was sown on 16th November, 2019 at row spacing of 30 cm by using 80 kg ha^{-1} seed rate and fertilizer with (20: 60: 20 NPK kg ha^{-1}). All the quantity of NPK was applied at the time of provide as basal application. The seed of gram crop was treated with suitable fungicide and rhizobium culture 2-3 gm kg^{-1} to protect the seed against diseases. During the crop growth period November to March.

Estimation of N, P and K uptake by crop and weeds

To estimate the uptake of N, P and K, samples were collected at harvest for weeds and crop. The samples were oven dried at 65^0C temperature. Nitrogen uptake by crop and weeds were determined by digesting the plant samples with suitable acid mixture of concentrated sulphuric acid. Phosphorus was estimated by Vanedomolybdate method in diacid mixture. The intensity of the colour developed was measured in a spectrophotometer, using blue filter. Potassium content was estimated from diacid digest material using Flame Photometer and was expressed as percentage K. The nutrient content and dry weight were used to calculate the total uptake of nutrients (NPK) as per the following formula.

$$\text{Nutrient uptake (kg ha}^{-1}\text{)} = \frac{\text{Nutrient content (\%) X Dry weight (kg ha}^{-1}\text{)}}{100}$$

Table 1: Nutrient (NPK) content (%) in weed species and Chickpea

S. No.	Weed species	Nutrient content (%)		
		Nitrogen	Phosphorus	Potassium
1.	*Cyperus rotundus*	0.65	0.29	1.78
2.	*Cynodon dactylon*	0.82	0.38	2.41
3.	*Medicago denticulata*	2.21	0.31	2.97
4.	*Vicia sativa*	1.91	0.27	2.92
	Chickpea Crop			
5.	Seed	2.95	0.61	0.70
6.	Stover	1.01	0.17	1.22

Results and Discussion

Nutrients (NPK) uptake by weeds

The predominant weed flora of the experimental field comprised of *Medicago arabica*, *Vicia sativa*, *Cynodon dactylon*, *Cyperus rotundus* L.,

Table 2: Nutrient (NPK) absorption by chickpea crop (seed + stover) (kg ha^{-1})

Treatment		Nutrient absorption (NPK kg ha^{-1})								
		Seed			Stover			Total (seed + stover)		
		N	P	K	N	P	K	N	P	K
T_1	Pendimethalin (38.7% EC) 1000 g ha^{-1}	34.2	7.13	16.0	32.4	6.72	27.4	66.37	13.85	42.29
T_2	Imazathaper (10% SL) 900 g ha^{-1}	23.0	3.40	10.2	26.1	3.66	19.9	49.12	7.06	29.39
T_3	Atrazin (50% WP) 1000 g ha^{-1}	26.6	4.18	11.9	29.1	4.33	21.3	56.11	8.51	32.46
T_4	Metribuzin (70% WP) 300 g ha^{-1}	27.8	5.13	13.2	32.4	5.48	22.7	60.22	10.61	35.05
T_5	Oxyflorfen (23.5% EC) 100 g ha^{-1}	27.6	6.01	13.7	35.6	5.50	25.8	63.30	11.51	38.91
T_6	Pendimethalin 500 g ha^{-1} fb Imazathaper 450 g ha^{-1}	23.6	5.68	12.7	32.9	4.99	24.9	56.57	10.67	37.05

T_7	Pendimethalin 500 g ha^{-1} fb Oxyflorfen 50 g ha^{-1}	22.4	4.84	10.3	31.2	5.42	22.9	53.76	10.26	32.65
T_8	Metribuzin 150 g ha^{-1} fb Oxyflorfen 50 g ha^{-1}	23.5	4.46	11.3	30.9	5.60	22.9	54.51	10.06	33.75
T_9	Atrazin 500 g ha^{-1} fb Metribuzin 150 g ha^{-1}	29.5	5.47	16.1	31.9	6.52	22.7	61.91	11.99	37.76
T_{10}	Imazathaper 450 g ha^{-1} fb Atrazin 500 g ha^{-1}	26.2	5.30	12.5	30.0	6.42	20.2	56.26	11.72	31.34
T_{11}	Hand weeding (30 DAS)	42.6	9.22	19.2	44.4	10.6	32.8	87.07	19.85	50.48
T_{12}	Weedy check (control)	14.3	2.22	7.25	23.7	2.93	18.2	38.15	5.16	24.85
SEm±		3.94	0.84	1.76	2.74	0.73	1.98	6.35	1.51	3.46
CD (P=0.05)		11.50	2.44	5.13	8.01	2.14	5.76	18.53	4.41	10.11

Note: DAS: Days after sowing, EC: Emulsifiable concentration, WP: Wettable powder, fb: followed by

Table 3: Nutrient (NPK) absorption by weed species and total weeds kg ha^{-1}

Treatment	*Cynodon dactylon*			*Cyperus rotundus*			*Medicago arabica*			*Vicia sativa*			Total weeds		
	N	P	K	N	P	K	N	P	K	N	P	K	N	P	K
T_1	1.97	0.93	5.80	0.73	0.34	2.13	10.81	1.50	14.27	5.01	0.57	7.86	18.52	3.34	30.06
T_2	1.91	0.93	5.71	1.13	0.49	3.02	12.88	1.79	17.25	4.78	0.65	7.24	20.70	3.86	33.21
T_3	2.64	1.29	7.90	0.71	0.32	1.95	4.05	0.57	5.44	6.93	0.98	10.67	14.32	3.16	25.97
T_4	2.08	0.95	6.12	1.28	0.57	3.49	12.50	1.74	16.83	5.14	0.84	7.86	20.99	4.11	34.31
T_5	2.42	1.17	7.33	1.25	0.56	3.43	5.67	0.79	7.62	5.58	0.91	8.52	14.92	3.42	26.90
T_6	1.28	0.58	3.80	0.88	0.39	2.43	15.82	2.21	21.24	3.99	0.56	6.10	21.27	3.75	33.56
T_7	2.02	0.94	5.94	0.82	0.36	2.25	12.87	1.79	17.31	3.99	0.57	6.08	19.70	3.66	31.57
T_8	2.56	1.20	7.75	1.29	0.58	3.55	6.11	0.85	8.21	3.49	0.46	5.29	13.44	3.09	24.80
T_9	2.91	1.28	8.57	1.06	0.47	2.90	8.46	1.18	11.37	8.79	1.22	13.40	21.22	4.15	36.24
T_{10}	2.76	1.32	8.46	0.93	0.42	2.61	8.01	1.11	10.78	9.60	1.35	14.66	21.31	4.20	36.51
T_{11}	0.59	0.28	1.75	0.29	0.11	0.77	2.14	0.30	2.86	1.46	0.21	2.27	4.48	0.91	7.65
T_{12}	4.52	2.40	13.46	3.03	1.41	7.41	24.23	3.34	31.33	15.77	2.57	24.37	47.60	9.72	76.67
S.Em±	0.31	0.14	0.90	0.33	0.14	0.90	2.52	0.35	3.39	1.45	0.21	2.22	2.40	0.36	3.37
CD (P=0.05)	0.91	0.40	2.63	0.97	0.42	2.63	7.36	1.03	9.90	4.23	0.60	6.48	7.01	1.05	9.82

Nutrient (NPK) absorption by chickpea crop (seed + stover) (kg ha^{-1})

The result on nutrient absorption by seed and stover affected by different weed management has been presented in Table 2 and Fig 1. The highest nutrient absorption by seed was observed in hand weeding (42.6: 9.22: 19.2) and minimum was in weedy check (14.3: 2.22: 7.25). The highest nutrient absorption by stover was observed in hand weeding (44.4: 10.6: 32.8) and minimum was in weedy check (23.7: 2.93: 18.2). The maximum nutrient absorption of hand weeding (87.07: 19.85: 50.48) and minimum was in weedy check (38.15: 5.16: 24.85) of total (seed + stover) weeds. Among different herbicidal treatments application of Pendimethalin 1000 g ha^{-1} was found the highest (66.37: 13.85: 42.29) and lowest was in Imazathaper 900 g ha^{-1} (49.12: 7.06: 29.:39) of total (seed + stover) weeds. Similar results were observed in chickpea by Singh *et al*., (2014) [9].

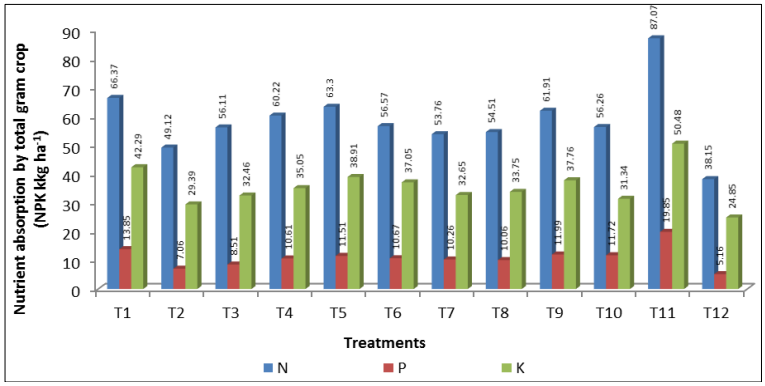

Fig 1: Nutrient absorption by total chickpea crop (NPK kg $^{-1}$)

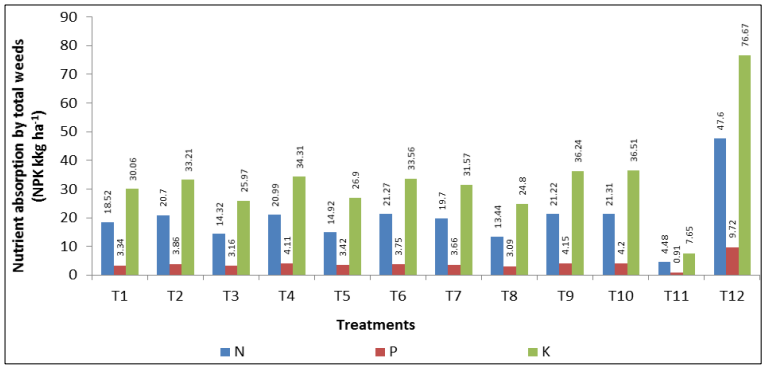

Fig 2: Nutrient absorption by total weeds (NPK kg $^{-1}$)

Nutrient absorption by weed species and total weeds (NPK kg ha^{-1})

The results on nutrient absorption by weeds as affected by different weed management in chickpea have been presented in Table 3 and Fig 2. The result revealed that there was different variation in nutrients absorption by weeds. Weedy check recorded significantly higher nutrient absorption of weed *viz*., *Cynodon dactylon* (4.52: 2.40: 13.46), *Cyperus rotundus* (3.03: 1.41: 7.41), *Medicago arabica* (24.23: 3.34: 31.33), and *Vicia sativa* (15.77: 2.57: 24.37). Hand weeding recorded significantly lower nutrient absorption of weeds *viz*., *Cynodon dactylon* (0.59: 0.28: 1.78), *Cyperus rotundus* (0.29: 0.11: 0.77), *Medicago arabica* (2.14: 0.30: 2.86), and *Vicia sativa* (1.46: 0.21: 2.27), Lower nutrient absorption of in these treatments attributed to lower weed density and dry weight. The maximum nutrient absorption of total weeds in weedy check (47.60: 9.72: 76.67) and minimum was in hand weeding (4.48: 0.91: 7.65). Among different herbicidal treatments application of application of Imazathaper 450 g ha^{-1} fb Atrazin 500 g ha^{-1} was found the highest (21.31: 4.20: 36.51) and lowest was in Metribuzin 150 g ha^{-1} fb Oxyflorfen 50 g ha^{-1} (13.44: 3.09: 24.80). The results are in conformity with findings of Singh *et al.*, (2014) [9], Chandrakar *et al.*, (2015) [2], Patel *et al*., (2006) [6], Ratnam *et al*., (2011) [8], Goud *et al*., (2013) [4].

Conclusion

From the experiment result, among the weed management it could concluded that hand weeding 30 DAS and Pendimethalin 1000 g ha^{-1} produce the highest nutrient (NPK kg^{-1}) absorption by chickpea crop. Minimum nutrient (NPK kg^{-1}) absorption of hand weeding 30 DAS and Metribuzin 150 g ha^{-1} fb Oxyflorfen 50 g ha^{-1} by total weeds.

References

1. Achten WMJ *et al*., Opportunities and constraints of promoting new tree crops – lessons learned from jatropha. Sustainability 2014;6:3213-3231.
2. Chandakar S, Sharma A, Thakur DK. Effect of chickpea (*Cicer arietinum* L.) varieties and weed management practices on quality parameters, nutrient content and uptake by crop and weed. J Progressive Agri 2015;6:29-31.
3. Choudhary BM, Patel JJ, Delvadia DR. Effect of weed management practices and seed rates on weeds and yield of chickpea. Indian J Weed Sci 2005;37:271-272.
4. Goud VV, Murade NB, Kharke MS, Patil AN. Efficacy of Imazethapyr and Quizalofop-ethyl herbicides on growth and yield of chickpea. The Bioscan 2013;8:1015-1018.
5. Kumar S. Weed management studies in summer mung. Ph.D. Dissertation, Haryana Agricultural University, Hissar, Haryana (India) 1985.
6. Patel BD, Patel VJ, Patel JB, Pate RB. Effect of fertilizers and weed Int. J Curr. Microbiol. App. Sci 2006, 6(3).
7. Poonia TC, Pithia MS. Pre-and post-emergence herbicides for weed management in chickpea. Indian Journal of Weed Science 2013;45(3):223-225.
8. Ratnam M, Rao AS, Reddy TY. Integrated weed management in chickpea (*Cicer arietinum* L.). Indian J Weed Sci 2011;43(1-2):70-72.
9. Singh G, Aggarwal N, Ram H. Efficacy of post-emergence herbicide imazethapyr for weed management indifferent mungbean (*Vigna radiata* L.) cultivars. Indian J Agric. Sci 2014;84(4):540-543.
10. Van Eijck J *et al*., Global experience with jatropha cultivation for bioenergy: an assessment of socio-economic and environmental aspects. Renew. Sustain. Energy Rev 2014;32:869-889.