The Pharma Innovation Journal 2022; 11(8): 1323-1326

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2022; 11(8): 1323-1326

www.thepharmajournal.com
Received: 08-06-2022
Accepted: 18-07-2022

Dhara D Lunagariya
Ph.D., Scholar, Department of Soil Science and Agricultural Chemistry, CAAST trainee student, NAU, Navsari, Gujarat, India

KG Patel
Professor and Head, Department of Soil Science and Agricultural Chemistry, NAU, Navsari, Gujarat, India

Susheel Singh
Assistant Professor, Department of Soil Science and Agricultural Chemistry, NAU, Navsari, Gujarat, India

KR Patel
Ph.D., Scholar, Department of Agronomy, NAU, Navsari, Gujarat, India

Corresponding Author:
Dhara D Lunagariya
Ph.D., Scholar, Department of Soil Science and Agricultural Chemistry, CAAST trainee student, NAU, Navsari, Gujarat, India

Effect of herbicidal treatments on yield and weed attributes of pigeon pea based cropping system

Dhara D Lunagariya, KG Patel, Susheel Singh and KR Patel

Abstract
A field experiment was conducted during *kharif* season of 2020-21 at Mega Seed, Pulses and Castor Research Unit, Navsari Agricultural University, Navsari to study the effect of herbicidal treatments on yield and weed attributes of pigeon pea based cropping system under large plot technique design. Application of pendimethalin 2000 g/ha gave significantly lowest weed population of monocot, dicot, sedge and total weeds at 60 and 90 DAS which was remain at par with the treatment of pendimethalin 1000 g/ha. The application of pendimethalin 1000 g/ha showed significantly lowest dry weight of weed at 90 DAS and at harvest which was remained at par with treatment of pendimethalin 2000 g/ha followed by imazethapyr 75g/ha, imazethapyr 150g/ha, oxyfluorfen 125 g/ha and oxyfluorfen 250 g/ha, respectively. Significantly higher seed yield and stalk yield was recorded under the application of pendimethalin 1000 g a.i./ha (T_2) at harvest and stood at par with the treatment of pendimethalin 2000 g a.i./ha followed by imazethapyr 75g/ha, imazethapyr 150g a.i./ha, oxyfluorfen 125 g a.i./ha and oxyfluorfen 250 g a.i./ha.

Keywords: Pigeon pea, yield, weed flora, dry weed weight, weed population

Introduction
Pigeon pea [*Cajanus cajan* (L.) Millsp.] commonly known as red gram, tur or arhar is originated in Asian continent. Pigeon pea is cultivated in tropical and sub-tropical areas between 30^0 N and 30 ^{0}S Latitude. Pigeon pea is the fifth prominent legume crop in the world. India being the largest producer of pigeon pea in the world contributes around 92% of the world's total production (FAOSTAT, 2013) [5]. After Chickpea (39%), pigeon pea (21%) is second most important pulse crop grown in India. Maharashtra, Madhya Pradesh, Karnataka, Uttar Pradesh, Gujarat and Jharkhand were the prominent pigeon pea producing states in India covering approximately an area of 4.46 M ha put of total arable land was involved in pigeon pea production during 2020 having production and productivity of 3.83 MT and 859 kg/ ha, respectively (Anon, 2020a) [1]. In Gujarat, it occupies an area of 212.70 thousand ha and production of 210.69 thousand tones with productivity 990.54 kg/ha during 2020 (Anon, 2020b) [2].

The pigeon pea is subjected to several abiotic and biotic stresses. Pigeon pea is also heavily affected with weeds which compete with pigeon pea for growth factors like nutrients, moisture and also provide shelter to insect pests. The critical period of crop weed competition is during the first eight weeks after sowing. The yield loss in sole pigeon pea due to weeds was estimated in the range of 32 to 90% (Talnikar *et al.* 2008) [19]. Weeds deprive the crops by 47% N, 42% P, 50% K, 39% Ca, and 24% Mg by harbouring number of pests. Therefore, it is imperative to manage weeds and pest at proper time with suitable methods to obtain maximum grain yield. Chemical weed control is one of the potential alternatives to control the weed infestation in many crops due to other socio-economic factors like non availability of working force, high labour cost as well as consistently varying climatic conditions *etc.*

Several herbicides are being used to control the weeds in pigeon pea. Among these pendimethalin (CIBRC, 2021) [7] is recommended to control these weeds in pigeon pea. However, other scientists also tested several other chemical herbicides such as alachlor, fluchloralin, oxyfuorfen, imazethapyr (Patel *et al.* 1993, Khanna *et al.* 2012 and Padamaja *et al.* 2013) [13, 8, 12]. Therefore, field experiments were conducted to find out effective weed control measures in pigeon pea using chemical weed control measures.

Material and Method
The present study was conducted at the Mega Seed, Pulses and Castor Research Unit, Navsari

Agricultural University, Navsari during *kharif* season of 2020-2021. Navsari Agricultural University campus is geographically located at 20° 57' N latitude and 72° 54' E longitude at an altitude of 10 meters above the Mean Sea Level. The soil of the experimental field was clay with pH value 7.5 to 7.7, electrical conductivity 0.40 to 0.49 dS/m, organic carbon 0.68%, available N 258.42 to 264.12 kg/ha, available P 40.23 to 45.80 kg/ha and available K 350.36-378.44 kg/ha.Total seven treatments of soil applied herbicides *viz*. T_1 (Control), T_2 pendimethalin 30% EC (1000 g a.i./ha), T_3 pendimethalin 30% EC (2000 g a.i./ha), T_4 oxyfluorfen 23.5 EC% (125 g a.i./ha), T_5 oxyfluorfen 23.5% EC (250 g a.i./ha), T_6 imazethapyr 10% SL (75 g a.i./ha), T_7 imazethapyr 10% SL (150 g a.i./ha) were taken. Pigeon pea variety 'GT-102' were sown at 12 kg seed per hectare, respectively. Pre-emergence herbicides (pendimethalin and oxyflourfen) were applied in the next day after sowing of the crop while post-emergence herbicide (imazethapyr) was applied 25 days after sowing the crop with the help of knapsack sprayer fitted with flat-fan nozzle using 500 liters of water per hectare. Weeds were allowed to grow freely in the control plots throughout the cropping season. Other crop management practices followed as per recommendations for the region.

Weed species associated with the crops in the experimental area were counted periodically and grouped according to the nature of cotyledons. The percentage composition of weed flora was estimated from unweeded control and weed population was worked out as per the standard formula at 30, 60 and 90 DAA stage. Various observations recorded periodically during the course of experiment, analyzed statistically by using analysis of variance technique appropriate to large plot technique. The treatment differences were tested for significance by 'F' test and the data in which the treatment effects were found significant the appropriate standard error of mean and the critical different were worked out at 5% level of significance.

Result and Discussion

Weed flora

The experimental field was infested with number of weed species comprising of monocot weeds *viz*., *Echinochloa crusgalli* (L.) Beauv, *Sorghum halepense* (L.) Pear, and Cynodon dactylon (Linn.) Pers and dicot weeds *viz*., *Amaranthus viridis* L., *Euphorbia hirta, Alternanthera sessilis., Digera arvensis Forsk., Convolvulus arvensis* L., *Trienthma portulacastrum* L., *Euphorbia hirta* L., *Physalis minima* L., *Phyllanthus maderaspatensis* and sedge weeds *viz., Cyperusr otundus.* Similar weed flora were also reported by Padmaja *et al.* (2013), Meena *et al.* (2010) Ratnam *et al.* (2011) Singh and Sekhon (2013) Goud, V. V. and Kumar *et al*. (2019) [12, 11, 17, 9] in pigeon pea crop.

Weed population

The results obtained from weed population study which includes enumeration of monocot, dicot, sedge and total weeds revealed that the weed population recorded on 30 DAA was not significantly affected with different herbicide application. However, the statistically significant effect of different herbicides on weed population was observed on 60 and 90 DAA. This might be due to persistence nature of pre-emergence herbicides. Due to slow initial growth of pigeon pea is unable to compete with weeds and fully utilize sunlight and available soil moisture at early growth stage provides an ample scope for emergence and growth of many annual weeds, which compete with crops (Kumar *et al.* 2019) [9]. Rao *et al.* (2015) [15] reported that significantly lowest weed population in pigeon pea were recorded in pendimethalin @ 0.75 kg a.i./ha PE + 1 HW/IC after 50 DAS followed by oxyfluorfen @ 100g a.i./ha PE + 1 HW/IC after 50 DAS. Kumar *et al.* (2019) [9] found the significantly lowest weed population in pigeon pea at 30 and 60 days after sowing (DAS) with application of pendimethalin at the rate of 1000 g a.i./ha as pre emergence. Singh *et al.* (2020) [18] reported significantly reduced weed density in pigeon pea when pendimethalin was applied@ 0.75 kg a.i./ha (PE) over control. These findings are in agreement with the present investigation.

Dry weight of weed

Result observed that statistically there was no significant effect of different herbicide treatments on dry weed weight recorded at 40 DAA. The differences in dry weight of weed at 60 days after sowing and at harvest were found to be significant. The treatment of pendimethalin 1000 g a.i./ha (T_2) showed significantly lowest dry weight of weeds at 60 DAA and at harvest which was remained at par with remaining all treatment except control. However, the highest values of dry weed weight were observed under T_1 (Control). Here, significantly lower dry weed weight was recorded in the application of pendimethalin RD and 2xRD mainly due to the lowest weed counts and because of batter weed control in pre emergence application of this herbicide. These herbicides control the annual and broad leaf weeds. Chavan *et al.* (2018) [4] reported that significantly lower dry weed weight in pigeon pea field were recorded in PRE application of pendimethalin @ 1.0 kg a.i./ha over weedy check. Chandrakar *et al.* (2018) [3] reported that lowest weed dry weight of weed in chickpea were secured under treatment of weed free followed by treatment of pendimethalin @ 0.75 kg /ha with one hand weeding at 45 days after sowing. Kumar *et al.* (2019) [9] reported significantly lowest dry weight of weed in treatment pendimethalin 1000 g a.i./ha as Pre emergence over weedy check. These findings are in agreement with the present investigation.

Stalk yield and seed yield

The result presented in Table 3revealed that stalk yield and seed yield of pigeon pea was significantly influenced due to different treatments of herbicides. Significantly higher stalk and seed yield was recorded under the treatment pendimethalin 1000 g a.i./ha (T_2) at harvest and stood at par with the treatment of pendimethalin 2000 g a.i./ha, imazethapyr 75g a.i./ha, imazethapyr 150g a.i./ha, oxyfluorfen 125 g a.i./ha and oxyfluorfen 250 g a.i./ha. except control. The lowest stalk and seed yield of pigeon pea was recorded under untreated control treatment (T_1). The significant higher yield was observed in treatments which received herbicides over untreated control. This might be due herbicide treated plot have comparatively higher weed control over untreated control plots. This may also facilitates the better availability of moisture, nutrients and solar energy reflecting in higher vegetative growth. Similar finding were also established by Rai *et al*. (2016) [14] in pigeon pea. Khanna *et al.* (2012) [8] found significantly higher grain yield of pigeon pea in pendimethalin 0.75 kg a.i./ha as pre emergence followed by 0.45 kg a.i./ha. Similar result was recorded by Singh and

Singh and Sekhon (2013) [17]. Kumar *et al.* (2020) [10] reported that significantly highest yield and yield attributes of pigeon pea were recorded in PRE application of pendimethalin @ 1000 g a.i./ha followed by imazethapyr @ 75 g a.i./ha at 45 DAS, imazethapyr @ 100 g a.i./ha at 45 DAS. These findings are in agreement with the present investigation.

Table 1: Effect of different herbicide on weed population at 40, 60 and 90 DAA

Treatment	Days After Application (DAA) (No./m^2)											
	30				60				90			
	Mono.	Dicot	Sedge	Total	Mono.	Dicot	Sedge	Total	Mono.	Dicot	Sedge	Total
T_1: Control	(3.94) 15.00	(3.37) 11.00	(3.76) 13.67	(6.33) 39.67	(4.49) 19.67	(4.41) 19.00	(4.81) 22.67	(7.86) 61.33	(4.66) 21.33	(4.52) 20.00	(4.66) 21.33	(7.93) 62.67
T_2: Pendimethalin 1000 g a.i./ha	(3.49) 11.67	(2.92) 8.00	(3.13) 9.33	(5.43) 29.00	(3.38) 11.00	(2.90) 7.92	(2.80) 7.33	(5.17) 26.25	(3.58) 12.33	(3.08) 9.00	(2.74) 7.00	(5.37) 28.33
T_3: Pendimethalin 2000 g a.i./ha	(3.33) 10.67	(2.80) 7.33	(3.08) 9.00	(5.24) 27.00	(3.34) 10.67	(2.86) 7.67	(2.68) 6.67	(5.05) 25.00	(3.54) 12.00	(3.03) 8.67	(2.68) 6.67	(5.28) 27.33
T_4: Oxyfluorfen 125 g a.i./ha	(3.52) 12.00	(3.24) 10.00	(3.52) 12.00	(5.87) 34.00	(3.57) 12.33	(3.18) 9.67	(3.23) 10.00	(5.70) 32.00	(3.49) 11.67	(3.28) 10.33	(3.44) 11.33	(5.81) 33.33
T_5: Oxyfluorfen 250 g a.i./ha	(3.43) 11.33	(3.19) 9.67	(3.33) 10.67	(5.67) 31.67	(3.49) 11.67	(3.19) 9.67	(3.13) 9.33	(5.58) 30.67	(3.43) 11.33	(3.24) 10.00	(3.38) 11.00	(5.72) 32.33
T_6: Imazethapyr 75g a.i./ha	(3.67) 13.00	(3.13) 9.33	(3.49) 11.67	(5.87) 34.00	(3.75) 13.67	(3.24) 10.00	(3.23) 10.00	(5.84) 33.67	(4.02) 15.67	(2.97) 8.33	(3.24) 10.00	(5.87) 34.00
T_7: Imazethapyr 150g a.i./ha	(3.54) 12.00	(2.92) 8.00	(3.44) 11.33	(5.64) 31.33	(3.72) 13.33	(3.19) 9.67	(3.13) 9.33	(5.73) 32.33	(3.98) 15.33	(2.86) 7.67	(3.19) 9.67	(5.76) 32.67
S.Em±	0.13	0.12	0.14	0.14	0.13	0.10	0.12	0.13	0.13	0.11	0.10	0.17
CD at 5%	NS	0.36	NS	0.42	0.40	0.31	0.37	0.40	0.39	0.33	0.32	0.52
CV %	6.21	6.66	7.22	4.17	6.24	5.45	6.37	3.86	5.85	5.72	5.43	5.02

Note: Figure in parenthesis refers to actual weed population and those outside are $\sqrt{X + 0.5}$ transformed values

Table 2: Effect of different herbicide on dry weight of weed at 40, 60 DAA and at harvest

Treatment	Days After Application (DAA) (g./m^2)		
	40	60	At harvest
T_1: Control	367.41	411.67	492.25
T_2: Pendimethalin 1000 g a.i./ha	300.13	314.84	396.54
T_3: Pendimethalin 2000 g a.i./ha	304.89	322.06	407.73
T_4: Oxyfluorfen 125 g a.i./ha	326.54	323.08	420.74
T_5: Oxyfluorfen 250 g a.i./ha	328.58	327.20	408.77
T_6: Imazethapyr 75g a.i./ha	319.60	334.82	460.23
T_7: Imazethapyr 150g a.i./ha	323.22	343.93	455.84
S.Em±	27.32	19.64	20.85
CD at 5%	NS	59.57	63.24
CV %	14.59	10.01	8.31

Table 3: Effect of different herbicide on dry pod and stalk yield of pigeon pea

Treatment	Yield (kg/ha)	
	Seed	Stalk
T_1: Control	938	2979
T_2: Pendimethalin 1000 g a.i./ha	1468	4438
T_3: Pendimethalin 2000 g a.i./ha	1424	4271
T_4: Oxyfluorfen 125 g a.i./ha	1285	3888
T_5: Oxyfluorfen 250 g a.i./ha	1279	3870
T_6: Imazethapyr 75g a.i./ha	1360	4113
T_7: Imazethapyr 150g a.i./ha	1302	3940
S.Em±	89.86	277.30
CD at 5%	273	841
CV %	12.03	12.23

Conclusion

Application of all the herbicidal treatments significantly reduced weed population/m^2, dry weight of weed and significantly increase stalk yield and seed yield of pigeon pea compared with unweeded control. The unweeded control treatment recorded the maximum weed population at every stage of observations. In which the application of pendimethalin 2000 g/ha (T_3) gave significantly lowest weed population of monocot, dicot, sedge and total weeds at 60 and 90 DAS which was remain at par with the treatment of pendimethalin 1000 g/ha (T_2). Significantly lowest dry weight of weed and significantly higher seed yield and stalk yield was recorded under the application of pendimethalin 1000 g a.i./ha (T_2) at harvest and stood at par with the treatment of pendimethalin 2000 g a.i./ha followed by imazethapyr 75g/ha, imazethapyr 150g a.i./ha, oxyfluorfen 125 g a.i./ha and oxyfluorfen 250 g a.i./ha, respectively.

Reference

1. Anonymous. Fourth Advance Estimates of Production of Commercial Crops. Department of Agriculture, Cooperation and Farmers Welfare, Directorate of Economics & Statistics, 2020a.
2. Anonymous. Final advance estimate of A, P, Y of *kharif* and *rabi* crops of Gujarat state. Directorate of agriculture, Gandhinagar, Gujarat, 2020b.
3. Chandrakar S, Raj VC, Chandrakar M. Effect of weed management on weeds and yield of chickpea varieties under south Gujarat conditions. Trends in Biosciences. 2018;11(3):383-385.
4. Chavan AS, Raj VC, Waghmare PK. Residues studies of pendimethalin and other herbicides in pigeon pea field

through bioassay technique. International Journal of Current Microbiology and Applied Sciences. 2018;6:1866-1873.
5. FAOSTAT, 2013. http://faostat.fao.org.
6. Goud VV, Patil AN. Increase in growth and yield of pigeon pea with weed management. Indian Journal of Weed Science. 2014;46(3):264-266.
7. http://cibrc.nic.in/.major_uses_of_herbicides_as_on_01.01.2021.pdf (ppqs.gov.in)
8. Khanna, Veena Singh, Guriqbal Sharma, Poonam, Kaur Harpreet. Influence of Herbicides on Rhizobium Growth and its Symbiosis with Pigeon pea, Trends in Biosciences. 2012;5(2):133-135.
9. Kumar A, Dhaka AK, Kumar S, Singh S, Punia SS. Weed management indices as affected by different weed control treatments in pigeon pea [*Cajanus cajan* L.] Journal of Pharmacognosy and Phytochemistry. 2019;8(3):3490-3494.
10. Kumar A, Dhaka AK, Kumar S, Singh S, Singh A. Influence of imidazolinones alone and in combination on pigeon pea (*Cajanus cajan* L.) Indian Journal of Agricultural Sciences. 2020;90(7):1319-22.
11. Meena Babulal, Sagarka BK, Pisal RR. Efficacy of new herbicides in *kharif* pigeon pea under south Saurashtra condition. Indian Journal of Weed Science. 2010;42(1-2):98-100.
12. Padmaja B, Reddy MM, Reddy VVD. Weed control efficiency of pre and post emergence herbicide in pigeon pea. Journal of food Legume. 2013;26(1-2):44-45.
13. Patel ZG, Raj VC, Patel HC, Patel CL. Integrated weed management for sustainable agriculture. Indian society of weed science. 1993;3:152-153.
14. Rai CL, Tiwari RK, Sirothia P, Pandey S. Intercropping and weed management effects on weed dynamics, productivity and economics of pigeon pea. Indian Journal of Weed Science. 2016;48(1):44-47.
15. Rao PV, Reddy AS, Rao YK. Effect of integrated weed management practices on growth and yield of pigeonpea [*Cajanus cajan* L.] International Journal of Plant, Animal and Environmental Sciences. 2015;5(3):124-127.
16. Ratnam M, Rao AS, Reddy TY. Integrated weed management in chickpea (*Cicer arietinum* L.). Indian Journal of Weed Science. 2011;43(1&2):70-72.
17. Singh, Sekhon. Integrated Weed Management in Pigeonpea [*Cajanus cajan* (L.)]. World Journal of Agricultural Sciences. 2013;9(1):86-91.
18. Singh AK, Singh RS, Singh R, Kumawat N, Singh NK, Singh SP, *et al*. Effect of weed management on weed interference and production potential of long duration pigeonpea (*Cajanus cajan* L.) under irrigated ecosystem. International Journal of Current Microbiology and Applied Sciences. 2020;9(1):676-689.
19. Talnikar AS, Kadam GL, Karande DR, Jogdand PB. Integrated weed management in pigeonpea [*Cajanus cajan* (L.) Millsp.]. International Journal of Agriculture Science. 2008;4(1):363-370.