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Studies On Weed Competition In Intercropping System Of Pearl Millet (Pennisetum Glaucum L.) with legumes as fodder

Ravindra Meena[1],Amandeep Kaur[2],Rohitashv Nagar[3] Deepak Nagar[4]

[1]School of Agricultural Science, Career Point University, Kota, Rajasthan, India, meena.ravindra@cpur.edu.in

[2]Department of Agronomy, School of Agriculture, Lovely Professional University, Phagwara, Punjab, India

[3,4]School of Agricultural Science, Career Point University, Kota, Rajasthan, India, meena.ravindra@cpur.edu.in

ABSTRACT A field experiment was conducted at the farm of Lovely Professional University, phagwara (Punjab) to Study on Weed Competition in Intercropping System of Pearl millet (*Pennisetum glaucum* L.) With legumes as Fodder. The experiment was comprised of pearl millet sole and intercropping system with pre-emergence herbicide dose and in control with legumes fodder i.e. Cowpea and guar by Randomized block design (RBD) with replicated thrice. Yield, growth and quality parameters were recorded during the research work. In Pendimethalin@0.75kga.i/ha (Pearl millet + Guar) followed by Pendimethalin@0.75kga.i/ha (Pearl millet + Cowpea) resulted highest plant height, number of leaves, leaf stem ratio, leaf weight, stem weight, available of Nitrogen in soil, available Phosphorus in soil, available Potassium in soil, crude fiber and dry matter production. The growth parameters like plant height, no. of leaves and leaf stem ratio were periodically recorded at 30, 45 and harvest and proximate compositions were recorded after harvest of the crop. Weeds were recorded lowest in Pendimethalin@0.75kga.i/ha (Pearl millet + Guar) followed by Pendimethalin@0.75kga.i/ha (Pearl millet + Cowpea) because of effectiveness of pre-emergence herbicide as compare to control in both sole and intercropping. From the analysis of research done, it has been concluded that Pendimethalin@0.75kga.i/ha showed growth and yield more effective in pearl millet intercrops with Guar and pearl millet intercrops with cowpea in comparison to other among treatments.

Keywords: Intercropping system, Fodder, Legumes, Pearl millet, weeds.

I INTRODUCTION

In the era 90's cultivation of two or more crops in the same piece of land was not aware of it, not in the many other countries of the worldwide. By changing of time this challenge comes to know in many countries and day by day increases of the population, increases require for food for live. Intercropping system capable to cover the time of two crops in the same time and provide food to the population with no efficient use of resources and more convenient to farmers and low land farmers in the country (X. Joseph et al. 2018). Intercropping system adopted in various cereals, millets, pulses and oilseeds crops at the same time on the same piece of land which leads to reduce the loss of crop failures, behave as protection against pests, helps to maintain soil fertility (M.G. Manjunath et al. 2017). Intercropping legumes-cereals is growing to increase the productivity in many parts of developing countries. Intercropping Practices, at the same time growing more than two crops together in a field which helps to increase the total yield as compared to growing individual crop, By the utilize of resources crop have the ability to increase productivity (Willey,1979).

Pearl millet (*Pennisetum typhoideum*) is the most durable crop of India as it is staple food, Forage for the most of the people of the country. Among the countries which are growing Pearl millet, India has the largest area under pearl millet (9-10 million ha) accounting 50% of the global production which produces 7-8 million tons of grains (Charu Lata *et al.* 2019). Rajasthan is the topmost in area and production of pearl millet (ram and Singh, 2003) followed by rice and wheat and other cereals (Yadav and rai, 2013). Pearl millet variously classified as *Pglaucum*, *Pamericanum*, or *spicatum*, and known as Bajra in India (Taylor 2004). Pearl millet becomes rank third followed by wheat and rice (GOI, 2008). It is the most important grain cereals crop which has cultivated for both purposes (grain and fodder) for human and livestock. The suitable temperature for better germination of pearl millet is 23 to 32*C. Pearl millet can tolerant high range of temperature. The required optimum rainfall to pearl millet is near to 500-800 mm. it is a drought tolerant crop and grow where is water scarcity, high temperature and low moisture content. Pearl millet has the ability to grow in dried areas. Pearl millet is cultivated in arid and semi arid in different regions of India (Yadav and rai, 2013). Nutrition value of Pearl millet is contributing a huge role in human diet which is high level of zinc, lipids, carbohydrates and proteins. Pearl millet contains approx. 9 to 13% protein, which is more than rice (7.2%) barley (11.5%), maize (11.1%) and sorghum (10.4%). It also contains approx. 8% fat which is higher than rice wheat, barley and sorghum. Pearl millet is 40% rich in amino acid, methionine and lysine as compared to maize (Leder 2004). The nutritional benefits of pearl millet are its high content of fibre about 2.0%.

II Literature Review

Material and Methods

The present study entitled "Study onWeedCompetitioninIntercroppingSystem

ofPearlmillet(*Pennisetumglaucum*L.) withlegumesasFodder"was conducted at the agriculture research farm, Department of Agronomy, School of Agriculture, Lovely Professional University, Phagwara, Punjab, during Kharif season 2019-20. The soil of the research experiment site was low in available nitrogen (199.3 Kg/ha), high in available phosphorus (27.9 kg/ha) and potassium (311.3kg/ha). The experiment was carried out randomized block design (RBD) with three replications. Total ten treatments including T1 Control (sole Pearl millet), T2 Control (Pearl millet + Cowpea), T3 Control (Pearl millet + Guar), T4 Pendimethalin@0.75kga.i/ha (sole Pearl millet), T5 Pendimethalin@0.75kga.i/ha (Pearl millet + Cowpea), T6 Pendimethalin@0.75kga.i/ha (Pearl millet + Guar), T7 Control (sole Cowpea), T8 Control (sole Guar), T9 Pendimethalin@0.75kga.i/ha (sole Cowpea), T10 Pendimethalin@0.75kga.i/ha (sole Guar) was applied. The total area of the plot was 800 sq m. where plot size was 5×4 Square meter. Total plots for experiment were 30 including replications. Land preparation was done and irrigation was applied to field for betterment of soil. After those seeds were sowing with suitable spacing to plots according to treatments. Calculated Fertilizer doses were applied to plots by broadcasting method at the time of sowing. Sowing was done on 10th April 2018. The first irrigation was done at sowing time and next two to three irrigations were done according to scheduled time. The growth parameters were mainly plant height (cm), no. of leaves per plant, Leaf stem ratio, yield (q/ha). Plant height was measured with the help of measuring tape from base of the plant in tagged plants in each plot. Number of leaves was counted by randomly tagged plants in each plot and average value was calculated. The fresh forage yield was taken after cutting under 30×30 cm quadrate in two spot in each plot and converted it into q/ha. The harvested crop was placed in direct sunlight for dry purpose and also carried into hot air oven under optimum temperature. For checking effect of weeds on crops, weed count and no. of weeds were recorded. The data was analyzed by using Duncan's Uses Harmonic Mean Sample Size for partition of mean (Gomez and Gomez, 1984). Data was observed on periodically at 30 days after sowing, 45 days after sowing and at harvest time.

Growth parameters:

The data given in table 2 showed the value of plant height, no. of leaves, leaf weight, stem weight, leaf stem ratio and yield of pearl millet with intercropping system (cowpea, guar) under the influence of pre-emergence herbicide.

Plant height (cm): The treatment consists of Pendimethalin@0.75kga.i/ha (sole Cowpea) T9 resulted significant ($P<0.05$) higher plant height and lowest was recorded in control at 30DAS. But at 45 DAS and harvest Pendimethalin@0.75kga.i/ha (Pearl millet + Guar) T6 followed by Pendimethalin@0.75kga.i/ha (Pearl millet + Cowpea) T5 was recorded higher plant height and lowest was observed in Control (sole Pearl millet) T1. In cowpea case, the

maximum height of plant was observed in Pendimethalin@0.75kga.i/ha (sole Cowpea) T9 and lowest was recorded in Control (sole Cowpea) T7. In guar, the maximum height was Pendimethalin@0.75kga.i/ha (sole Guar) T10. This may be due to influenced by intercropping system which was significantly increase the plant growth.

No. of leaves per plant: The highest number of leaves was recorded by Pendimethalin@0.75kga.i/ha (Pearl millet + Guar) T6 followed by Pendimethalin@0.75kga.i/ha (Pearl millet + Cowpea) T5 which was significant ($P<0.05$). The lowest number of leaves was recorded in Control (sole Pearl millet) T1 followed by Control (sole Cowpea) T7.

Leaf weight (kg/plant): On comparing basis, the average mean of individual intercrops, the highest leaf weight was observed for treatment T6 (0.22 kg/plant)followed by T5 (0.16 kg/plant) in pearl millet which was significant ($P<0.05$) and lowest was recorded in T2 (0.036 kg/plant) under control in intercropping. The maximum leaf weight was observed T9 (0.16 kg/plant) which was significant ($P<0.05$) and lowest was recorded in control in cowpea. The highest leaf weight in guar crop was observed in T10 (0.063 kg/plant) which was significant ($P<0.05$) and lowest in control treatment. This may be both intercrops were collaborated with each other nicely and intercropping influenced the weight of leaf. Leaf weight was maximum in treatments T6 (0.22), T9 (0.16) and T10 (0.06) with comparison of herbicidal effect on it and control.

Stem weight (kg/plant): The average mean of the stem weight was recorded highest for treatment T6 (0.86 kg/plant) followed by T5 (0.72 kg/plant) and T4 (0.44 kg/plant) which were significant ($P<0.05$) and lowest average mean was observed in control treatments for pearl millet. The average mean of stem weight of cowpea was recorded maximum in treatment T9 (0.63) which was significant ($P<0.05$) and lowest in control. In guar, stem weight was observed in treatment T10 (0.48) but lowest was recorded in control treatment. Therefore, the average mean of stem weight at harvesting stage was recorded maximum in treatment T6 (0.86), T5 (0.72) for pearl millet this was because of increase of yield and plant growth attributes by effect of herbicide and intercropping system adopted.

Leaf stem ratio: The highest leaf stem ratio at the time of harvest was recorded in treatment T6 (0.25 kg plant^{-1}) followed by T5 (0.22 kg plant^{-1}) which was significant ($P<0.05$) and lowest was observed in control for pearl millet. For Cowpea, the maximum value of leaf stem ratio was obtained by treatment (0.22 kg plant^{-1}) and lowest in control. For guar, the maximum leaf stem ratio was recorded in T9 (0.16 kg plant^{-1}) which was significant ($P<0.05$) and lowest for control.

Yield: The maximum yield was recorded at harvest that significant ($P<0.05$) intercropping than sole cropping. The highest yield was recorded in treatment T6 (45.5 q/ha) followed by T5 (40.3 q/ha) which was significant ($P<0.05$) and the lowest was recorded in treatment T3 (24.0) in control for intercropping system. The highest yield of sole cowpea was recorded in treatment T9 (38.8 q/ha) under herbicide which was highly significant ($P<0.05$) and lowest was recorded in treatment T7 (31.7 q/ha) in control for sole cowpea. The maximum yield of sole guar was observed from treatment T10 (33.6 q/ha) and lowest in T8 (26.9 q/ha) in control. This was because of all the growth parameter was obtained highest in intercropping system

under herbicide dose effect and in sole crop under herbicide spray than control. Which indicates that growth attributes were highest due to effectiveness of herbicide in plants. This result was also similar with M.S Reddy and R.W. Willey 1981.

III Methodology

Quality parameter:

The data given in table 2 showed the value of crude fiber of pearl millet with intercropping system (cowpea, guar) under the influence of pre-emergence herbicide.

Crude fibre: By the comparing of sole crop to intercropping, the highest crude fibre content was recorded in T2 (5.1%) followed by T6 (5.0%) in pearl millet for intercropping system which was significant ($P<0.05$) and lowest was recorded T1 (4.0%) foe sole pearl millet. In sole cowpea, the highest crude fibre was obtained in treatment T9 (5.0%) which was significant ($P<0.05$). The average mean of crude fibre was recorded in treatment T2 & T6 because of pearl millet intercrops with cowpea that showed maximum crude fibre due to intercropping effects on it. The lowest was obtained in treatment T1 in sole pearl millet for control. Under control, the yield was obtained very less as compare to herbicidal dose effect, and the growth was also obtained lowest in control under sole crop with compare to herbicide dose effect in sole crop.

Result

Result and Discussion

The result was based on Growth parameters, yield of fodder, quality parameters and other various parameters were discussed below:

Weed Parameters:

Weed count: The maximum weed count (8.43 no. m^{-2}) followed by (8.06 no. m^{-2}) was obtained in treatment T7 and T8 in sole cowpea and sole guar for control that was significant ($P<0.05$). The minimum weed population was recorded in treatment T6 (3.66 no. m^{-2}) followed by T5 (5.03 no. m^{-2}) in intercrops with pearl millet for herbicide dose spray. This was because of herbicide spray as pre-emergence herbicide to the soil, improvement of yield and growth of the plant due to effective weed management. By weed management, weeds were reduced by effective herbicide (pendimethalin) dose. This result was similar to kumara P (2021)

Weed dry weight: The maximum weed dry weight at harvest was recorded in treatment T8 (9.70 gm) followed by T7 (9.13 gm) for control. Which was moderately significant ($P<0.05$). The lowest dry weight of weeds was observed in treatment T6 (4.26 gm) followed by T5 (4.70 gm) in herbicide applied plots. Which was significant ($P<0.05$). This was may be because of suppression of weeds under pendimethalin spray in pre-emergence time. It showed that weeds occur less in intercropping system under pendimethalin spray. This result was similar to Singh et al. (2017).

Table 1 Effect of pre-emergence herbicides on plant height, no. of leaves, leaf weight, stem weight, leaf stem ratio and yield in pear millet with intercropping crops (cowpea, guar)

	Treatments	

Parameters	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	SED	Level of Sig.
Plant height												
30DAS	0.36^{abc}	0.31^{a}	0.31^{a}	0.34^{ab}	0.32^{a}	0.33^{ab}	0.37^{a}	0.33^{bc}	0.39^{ab}	0.34^{c}	0.00	S
45DAS	0.85^{a}	0.91^{ab}	0.90^{ab}	0.88^{ab}	1.05^{cd}	1.10^{d}	0.98^{bc}	0.82^{a}	1.04^{cd}	0.85^{a}	0.01	S
Harvest	1.56^{cd}	1.67^{cde}	1.70^{de}	1.64^{cd}	1.73^{de}	1.98^{e}	1.13^{ab}	1.00^{a}	1.18^{bc}	1.49^{ab}	0.06	S
No. of leaves												
30DAS	4.3^{a}	4.6^{a}	5.0^{a}	5.3^{a}	5.6^{a}	6.0^{a}	20.9^{a}	32.3^{c}	34.6^{c}	33.0^{c}	2.49	S
45DAS	9.3^{a}	10.3^{a}	8.3^{a}	11.0^{a}	11.6^{a}	12.0^{a}	40.3^{b}	63.3^{c}	43.6^{b}	65.6^{c}	4.15	S
Harvest	13.0^{a}	13.3^{a}	12.6^{a}	14.6^{a}	15.0^{a}	15.3^{a}	44.3^{b}	72.6^{d}	50.3^{d}	73.0^{d}	4.47	S
Leaf weight	0.043^{a}	0.036^{a}	0.050^{a}	0.046^{a}	0.166^{c}	0.220^{d}	0.053^{a}	0.050^{a}	0.106^{b}	0.063^{a}	0.01	S
Stem weight	0.37^{a}	0.42^{a}	0.39^{a}	0.44^{a}	0.72^{b}	0.86^{b}	0.44^{a}	0.37^{a}	0.63^{b}	0.48^{a}	0.03	S
Leaf stem ratio	0.11^{a}	0.09^{a}	0.12^{a}	0.10^{a}	0.22^{bc}	0.25^{c}	0.11^{a}	0.13^{a}	0.16^{ab}	0.13^{a}	0.01	S
Yield (q/ha)	27.7^{ab}	28.4^{ab}	24.0^{a}	33.6^{bcd}	40.3^{de}	45.5^{e}	31.7^{bc}	26.9^{ab}	38.8^{cde}	33.6^{bcd}	1.33	S

SED= Standard error deviation, DAS= day after sowing, T1, T2. T3….. T10= treatments, S= (p≥0.05),

^{a,b,c,d}mean values with different superscripts differ significantly.

Table 2 Effect of pre-emergence herbicides on crude fiber on pearl millet with intercropping crops (Cowpea, Guar)

Parameters	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	SED	Level of Sig.
Crude Fiber %	4.0^{a}	4.2^{d}	4.6^{cd}	4.3^{ab}	4.7^{bcd}	5.0^{cd}	4.5^{bc}	4.7^{bcd}	4.8^{cd}	4.7^{bcd}	0.07	S

SED= Standard error deviation, DAS= day after sowing, T1, T2. T3….. T10= treatments, NS= (p≥0.05),

^{a,b,c,d}mean values with different superscripts differ significantly.

Table 3. Effect of pre-emergence herbicides on weed growth in pearl millet with intercropping crops (Cowpea, Guar)

Parameters	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	SED	Level of Sig.
Weed count												
30DAS	7.03^{e}	6.86^{e}	7.03^{e}	6.10^{d}	4.33^{b}	3.63^{a}	6.90^{e}	6.16^{d}	4.43^{b}	5.20^{c}	0.23	S
45DAS	7.76^{e}	6.93^{de}	7.63^{e}	7.63^{e}	5.46^{b}	4.16^{a}	7.86^{e}	7.83^{e}	5.80^{bc}	6.36^{bcd}	0.23	S
Harvest	7.36^{e}	6.46^{d}	7.90^{ef}	5.26^{bc}	5.03^{b}	3.66^{a}	8.43^{f}	8.06^{ef}	5.26^{bc}	5.96^{cd}	0.28	S
Weed dry Weight												
30DAS	5.63^{bc}	5.16^{b}	5.73^{bc}	2.96^{a}	2.73^{a}	2.56^{a}	6.36^{c}	6.56^{c}	3.23^{a}	3.13^{a}	0.29	S
45DAS	7.50^{bc}	6.63^{b}	7.06^{b}									

4.00[a]	3.93[a]	3.46a	8.20[e d]	9.00[d]	
3.83[a]	4.46[a]	0.37S			
Harvest		9.36[d]	7.73[bc]	6.83[b]	
4.90[a]	4.70[a]	4.26[a]	9.13[cd]	9.70[d]	4.56[a]
5.06[a]	0.40S				

SED= Standard error deviation, DAS= day after sowing, T1, T2. T3….. T10= treatments, NS= (p≥0.05),

[a,b,c,d]mean values with different superscripts differ significantly.

Graph 1 Effect of pre emergence herbicides on yield of pearl millet with intercropping crops (Cowpea, Guar)

Conclusion:

The research was short, if repeated the research more accuracy and better results can be obtained. So, the farmers follow the practices done in T6 and T5 followed by T9 and T10. The best results recorded concludes that in Pendimethalin@0.75kga.i/ha (Pearl millet + Guar) followed by Pendimethalin@0.75kga.i/ha (Pearl millet + Cowpea) followed by Pendimethalin@0.75kga.i/ha (sole Cowpea) T9 and Pendimethalin@0.75kga.i/ha (sole Guar) T10. Weeds were recorded highly where Pendimethalin@0.75kga.i/ha is not applied and they do not show high growth and yield. Pearl millet intercrops with guar under pendimethalin dose is recommendable to farmers because its performance throughout the season in growth and quality attributes were highly significant (P<0.05). If farmers will apply Pendimethalin@0.75kga.i/ha (Pearl millet + Guar) and Pendimethalin@0.75kga.i/ha (Pearl millet + Cowpea), then the quality and yield of fodder can be improved with high scale profit.

Reference

[1] Charulataet al. (2019) "Effect of saline water irrigations on physiological, biochemical and yield attributes of dual-purpose pearl millet (Pennisetum glaucum) varieties" Indian Journal of Agricultural Sciences 89 (4): 624–33, April 2019/Article

[2] Yadav and rai (2013) "Genetic improvement of pearl millet in India" Agricultural research 2(4), 275-292, 2013.

[3] M.G. Manjunath et al (2017) Growth and yield of soybean and millets in intercropping systems;J. Farm Sci., 30(3): (349-353) 20

[4] Kumara P, et al. (2021) "Assessment of Yield Loss in Green Gram (Vigna radiata (L.) R. Wilczek) Cultivation and Estimation of Weed-Free Period for Eco-Friendly Weed Management" Proceedings 2021, 68, x. https://doi.org/ 10.3390/xxxxx

[5] Singh et al. (2017) "Influenced of intercropping and weed control measures on yield components and nutrient content of pearl millet" International Journal of current microbiology and applied sciences. special issue 4; 165-171.

[6] Reddy M.S and Willey R.W (1981) "Growth and resources use studies in intercrop of Pearl millet/Groundnut" Field Crop Research, 4(1981) 13-24.2

[7] Yadav et al. (2016), Effect of intercropping, crop geometry and organic manures on growth and yield of broccoli (Brassica oleracea var). Indian Journal of Agricultural Sciences 87 (3): 318–24