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Original Research Article

Effect of Sesame-based Intercropping and Weed Management Practices on Yield Contributing Parameters of Urd

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Keywords

Urd, Yield attributes, Weed management, intercropping

A B S T R A C T

A field experiment was conducted during at SIF, C.S. Azad University of Agriculture & Technology, Kanpur-208002 (UP) during two *Kharif* seasons of 2015 and 2016. The experiment consisted 12 treatments having four intercropping *viz*, sesame + maize (4:1), sesame + maize (8:2), sesame + urd (4:1) and sesame + urd (8:2) and three weed management practices viz, Hand weeding, Pre-emergence of *Pendimethalin* 30% EC@3.0 L/ha and Early post-emergence of *Alachlor* 50% EC@ 0.75 kg/ha replicated four times. The experiment was laid out in Factorial Randomized Block Design. The main crop as Sesame of Shekhar variety and sub crops as Maize of P-3441 variety and urd of Shekhar-2 variety were used in the study year. Effect of sesame-based intercropping and weed management on yield contributing parameters of urd was evaluated. Maximum pod weight/plant, grain weight per plant, pods/plant, test weight, nodules/plant was found in intercropping of sesame + urd (8:2) and minimum was found in sesame + urd (4:1) during the two years of study. Maximum dry weight of nodules/plant, number of branches/plant, pod weight/plant, grain/pod, pod/plant and test weight was found in hand weeding.

Introduction

Pulses are the main source of dietary protein, particularly for vegetarians, and contribute about 14 % of the total protein of an average Indian diet. Pulses cover an area of about 23.47 million hectares with an annual production of 19.78 million tonnes, and a productivity of 785 kg/ha in our country. Among the pulses, urdbean is an important crop in India. Blackgram is one of the most highly prized pulse crops, cultivated in almost all parts of India. It has inevitably marked itself as the most popular pulse and can be most appropriately referred to as the "king of the pulses" due to its mouth-watering taste and numerous other nutritional qualities. Whether it be the very special "Dal makhni" of Punjab or the "VadaSambhar" of South India, the taste rules the hearts of one and all alike.

Indian immigrants have popularized the taste worldwide as well. Urd/ blackgram is an important crop among pulses and is usually grown on marginal and sub-marginal lands

without weed management. Weeds reduce yield of blackgram to the extent of 78% (Shweta *et al.,* 2017). However, under present investigation efforts were made to explore the feasibility of growing blackgram as an intercrop. Therefore, the present study was carried out to investigate integrated effect of intercropping and weed management regimes on yield attributing parameters of blackgram.

Materials and Methods

A field experiment was conducted during at SIF, C.S. Azad University of Agriculture & Technology, Kanpur-208002 (UP) during two *Kharif* seasons of 2015 and 2016 (Table 1 and 2).

The experimental soil was sandy loam in texture (48.20% sand, 24.51% silt and 26.79% clay), poor in fertility in respect of available nitrogen (228.2 kg/ha) and organic carbon (0.42%) and medium in respect of available phosphorus (13.07 kg/ha) and available potassium (173.76 kg/ha). Soil was slightly alkaline in reaction (pH 7.70).

The experiment was laid out in a split plot design with three replications. Four intercropping systems, viz. sesame + maize (4:1), sesame + maize (8:2), sesame + urd (4:1), and sesame + urd (8:2) intercropping system were allotted to main plot. Three treatments of weed management practices *viz*., hand weeding, *pendimethalin* and *alachlor* were allotted to subplot.

Thus, all total twelve (4 main plot x 3 subplot) number of treatment combinations were replicated thrice. The sources of fertilizers were Urea, DAP and MOP. As per treatment, full dose of nitrogen, phosphorus and potassium were applied as basal (just before sowing of the crop). The other crop management practices were performed as per standard recommendation of the region.

Observation recorded

Number and dry weight of nodules/plant

Three urd plants from five & ten row were digged-out and their nodes were counted and weighed. Total of three plants was divided by three and mean values were recorded.

Number of branches, pod and pods weight/plant

Three urd plants from fifth & ten rows were take-out for this purpose. Their branches and pods were counted and weighed. Total of three plants branches, pods and pods weight was divided by three and mean values were recorded.

Number of grain/pods

Pods from the sampled plants were collected and grains were separated through shelling by manual labour and then average was done to record number of grains per pods.

Grains weight/pods

The number of grains counted on three samples of pods was weighed separately for each treatment plots. Then the average was done and grain weight/pods were recorded in grains.

Test weight (g)

From seed produced of each treatment plots, 1000 grains of sesame &urd and 100 grain of maize were counted and weight to record in grams.

Statistical analysis

Data recorded in respect of yield and yield attributes, were analyzed by the method as

given by Gomez and Gomez *et al.*, (1984).

Results and Discussion

Nodules/plant

Data in respect of nodules/plant as influenced by different treatments is presented in table 3. The critical examination of the data clearly revealed significant effect of different row ratio and weed management on yield attributes during 2015 and 2016.It is evident from the data showed that the nodules/plant was influenced significantly by the intercropping and weeds management practices during the two years of study. The nodules/plant was recorded significantly maximum with the intercropping of sesame + urd (8:2) as compared to sesame + urd (4:1) during the two years of experimentation. Among the weed management practices, the hand weeding enhanced the nodules/plant and achieved significantly maximum number of nodules/plant as compared to other two weed management practices which was (9.18 and 9.62 %) as well as (3.24 and 2.46 %) over the *pendimethalin* and *alachlor* during the two years. Interaction effect of nodules/plant did not affect significantly due to intercropping system and weed management practices during the two years of investigation.

Dry weight of Nodules/plant (g)

It is perusal from the data given in table 3. The dry weight of nodules/plant was influenced significantly by intercropping and weeds management practices during the two years of investigation. The dry weight of nodules per plant was recorded significantly highest with the intercropping of sesame + urd (8:2) (89.25 and 89.83 g/plant) which was significantly superior over sesame + urd (4:1) (78.08 and 77.78 g/plant), respectively during the two years. The application of hand weeding was recorded highest dry weight of nodules/plant (88.46 and 87.71 g/plant). This is at par with *alachlor* (82.38 and 83.22 g/plant). These treatments were also significantly superior over *pendimethalin* (80.10 and 80.51 g/plant), respectively during the two years of study. Interaction effect of dry weight of nodules/plant did not affected significantly due to intercropping system and weed management practices during the two years of investigation.

Branches/plant

The data further examined given in Table 3 showed that the branches/plant was influenced significantly by the intercropping and weed management practices during both the year of study but the branches/plant was not affected by the weed management practices during 2016. The branches/plant was observed significantly highest with the intercropping of sesame + urd (8:2) while urd sown with sesame + urd (4:1) row ration was analysed minimum number of branches/plant. Among the weed management practices, the application of hand weeding was with highest number of branches/plant as compared to two other practices. The *alachlor* and *pendimethalin* noticed least number of branches/plant during the two years of observations. Interaction effect of branches/plant did not get affected significantly due to intercropping system and weed management practices during the two years of investigation.

Grain Weight/pod (g)

Data in respect of grain weight/pod given in table 4 was influenced significantly by intercropping and weed management practices except grain weight /pod during the two years of experimentation. The grain weight/plant was recorded not significant with the intercropping of sesame + urd (8:2) as compared to sesame + urd (4:1) during the two years of study. Among the weed

management practices, the application of hand weeding was not significantly noticed grain weight/pod as compared to *pendimethalin* and *alachlor*. Interaction effect of intercropping systems and weed management practices for grain weight/pod of urd was not found significant in the two years.

Pod weight/plant (g)

Data in respect of grain weight/pod given in table 4 was influenced significantly by intercropping and weed management practices except pods weight/plant (g) during the two years of experimentation.

The Pod weight/plant (g) was recorded significantly higher and lower with the intercropping of sesame + urd (8:2) as compared to sesame + urd (4:1) during the two years of study.

Among the weed management practices, the application of hand weeding was noticed maximum pod weight/plant as compared to *pendimethalin* and *alachlor*.

The least value of grain weight/plant was recorded with the application of *pendimethalin* (4.69 and 5.19 g) and *alachlor* (5.55 and 5.92 g). Interaction effect of intercropping system and weed management practices was not found significantly different in respect of pods weight/plant during the two years of investigation.

Grain weight/plant (g)

Data in respect of grain weight/pod given in table 4 was influenced significantly by intercropping and weed management practices except grain weight /pod during the two years of experimentation. The grain weight/plant was recorded significantly highest with the intercropping of sesame + urd (8:2) as compared to sesame + urd (4:1) during the two years of study. Among the weed management practices, the application of hand weeding noticed maximum grain weight/plant as compared to *pendimethalin* and *alachlor*. The least value of grain weight/plant was recorded with the application of *pendimethalin* (3.26 and 3.70 g) and *alachlor* (3.76 and 5.71 g), respectively. Interaction effect of intercropping system and weed management practices was not found significantly in respect of grain weight/plant during the two years of investigation.

Grain/pod

Yield attributes grain/pod was recorded during the two years and summarized in table 5. The grain/pod was exhibited non-significant variation due to intercropping during the two years of study.

The data under weed management practices was influenced significantly on grain/pod. The highest grain/pod was recorded with the application of hand weeding as compared to other two practices.

The hand weeding noticed maximum number of grain/pod with the data (5.71 and 8.21) as well as (6.46 and 10.67) over *pendimethalin* and *alachlor*, respectively during the two years of study. The interaction effect of intercropping and weed management practices was not affected significantly on biological yield during the two years.

Pods/plant

Pod/plant under different treatment has been presented in table 5. Number of Pod/plant of urd was recorded significantly highest with the intercropping of sesame + urd (8:2) (30.72 and 35.23) as compared to sesame + urd (4:1) (26.97 and 32.72), respectively during the two years of study.

Table.1 Weekly meteorological data recorded during crop period *Khraif* 2015

Std. weeks	Periods 2015	Rain fall (mm)	Temperature (^{0}C)		Relative humidity (%)		Wind fall (mm)	E.T.R. (mm/ day)
			Max.	Min.	Max.	Min.		
28	05 July - 11 July	35	33.83	23.99	87.43	67.86	8.26	6.37
29	12 July - 18 July	28.9	34.09	24.00	84.57	67.29	8.23	5.66
30	19 July - 25 July	11.4	33.80	24.36	86.00	67.86	8.87	6.29
31	26 July - 01 Aug.	2.0	34.1	23.4	77.0	59.6	10.0	6.6
32	02 Aug.- 08 Aug.	9.8	34.60	23.67	83.29	64.29	6.86	6.74
33	09 Aug. - 15 Aug.	90.0	34.09	20.54	88.43	68.86	5.06	6.49
34	16 Aug. - 22 Aug.	10	33.51	23.01	87.57	70.86	8.06	6.14
35	23 Aug. - 29 Aug.	12	34.39	23.20	86.43	65.86	6.46	6.17
36	30 Aug. - 05 Sept.	36.1	23.7	77.0	50.1	7.7	6.3	36.1
37	06 Sept. - 12 Sept.	-	36.6	22.3	72.6	52.3	6.6	6.3
38	13 Sept. - 19 Sept.	52.5	34.9	22.7	88.7	67.0	5.6	5.9
39	20 Sept. - 26 Sept.	46.5	34.1	21.4	82.9	61.9	6.0	4.9
40	27 Sept. - 03 Oct.	-	35.6	19.0	87.1	51.3	2.5	4.6
41	04 Oct. - 10 Oct.	-	35.7	17.6	85.6	47.4	2.8	4.1
42	11 Oct. - 17 Oct.	0.6	34.6	18.5	79.7	56.0	4.4	3.7
43	18 Oct. - 24 Oct.	-	34.6	15.9	87.4	50.7	2.6	3.4
44	25 Oct. - 31 Oct.	18.7	27.6	14.4	87.0	59.4	3.4	2.7
45	01 Nov. - 07 Nov.	-	31.3	13.3	90.7	50.6	2.0	2.3
46	08 Nov. - 14 Nov.	-	30.8	12.5	88.0	51.7	2.8	2.0
47	15 Nov. - 21 Nov.	-	30.1	9.9	91.3	45.4	1.7	2.0
48	22 Nov. - 28 Nov.	-	28.3	9.9	87.3	47.7	2.4	1.8
49	29 Nov. - 05 Dec.	26.0	26.9	13.0	92.0	63.6	3.5	1.3
50	06 Dec. - 12 Dec.	-	25.0	8.9	97.3	54.6	2.5	1.3
51	13 Dec. - 19 Dec.	-	21.7	3.3	89.6	41.4	3.5	1.5
52	20 Dec. - 26 Dec.	-	21.5	3.5	87.1	32.7	2.6	1.4
	Total	**379.5**	**-**	**-**	**-**	**-**	**-**	**-**
	Average	**-**	**31.4**	**19.6**	**85.0**	**55.0**	**4.9**	**5.4**

Table.2 Weekly meteorological data recorded during crop period *Khraif* 2016

Std. weeks	Periods 2015-16	Rain fall (mm)	Temperature (^{0}C)		Relative humidity (%)		Wind fall (mm)	E.T.R. (mm/ day)
			Max.	Min.	Max.	Min.		
28	03 July - 09 July	108	32.4	24.9	91.9	78.6	4.5	4.9
29	10 July - 16 July	84.9	32.2	26.1	89.4	86.1	6.2	4.5
30	17 July - 23 July	16.4	32.1	26.3	87.9	77.4	7.5	3.4
31	24 July - 30 July	75.4	32.3	25.4	90.7	77.3	5.4	3.7
32	31 July - 06 Aug.	25.2	32.5	26.2	88.4	72.3	6.5	3.3
33	07 Aug. - 13 Aug.	67.9	32.2	26.0	89.9	74.6	6.1	3.5
34	14 Aug. - 20 Aug.	33.1	31.5	25.3	90.1	77.1	6.1	3.3
35	21 Aug. - 27 Aug.	5.6	33.0	25.3	86.9	69.4	5.5	3.7
36	28 Aug. - 03 Sept.	-	34.3	26.6	87.3	67.6	4.4	4.2
37	04 Sept. - 10 Sept.	-	34.0	25.9	80.6	63.3	5.7	4.5
38	11 Sept. - 17 Sept.	13.0	32.5	24.9	88.0	72.6	1.3	4.3
39	18 Sept. - 24 Sept.	-	32.4	25.2	90.3	75.0	4.2	4.3
40	25 Sept. - 01 Oct.	-	33.1	24.4	91.0	64.4	4.7	4.1
41	02 Oct. - 08 Oct.	20.0	34.5	24.8	85.4	61.4	4.1	4.1
42	09 Oct. - 15 Oct.	14.0	33.9	20.2	83.0	44.1	3.2	4.0
43	16 Oct. - 22 Oct.	-	33.6	16.7	80.7	38.0	2.6	3.9
44	23 Oct. - 29 Oct.	-	33.2	16.2	80.4	35.6	3.3	3.7
45	30 Oct. - 05 Nov.	-	31.2	13.9	89.4	39.1	1.8	3.4
46	06 Nov. - 12 Nov.	-	30.1	13.0	83.7	45.1	3.1	3.1
47	13 Nov. - 19 Nov.	-	29.0	11.8	84.7	41.7	2.5	2.7
48	20 Nov. - 26 Nov.	-	28.5	12.4	78.3	43.4	4.9	2.4
49	27 Nov. - 03 Dec.	-	24.5	13.0	92.4	67.7	3.4	2.4
50	04 Dec. - 10 Dec.	-	19.7	10.2	99.7	71.9	3.2	1.8
51	11 Dec. - 17 Dec.	-	26.0	8.9	94.4	44.6	2.7	1.4
52	18 Dec. - 24 Dec.	-	24.3	8.1	91.0	50.4	4.0	1.5
53	25 Dec. - 31 Dec.	-	20.9	9.5	95.4	64.1	3.6	1.2
	Total	**463.5**	-	-	-	-	-	-
	Average	-	**30.5**	**19.7**	**88.1**	**61.6**	**4.3**	**3.4**

Table.3 Mean table for nodules/plant, dry weight of nodules/plant & branches/plant of urd crop during the two years.

Treatments	Mean Table					
	Nodules/Plant		Dry Weight of Nodules/Plant		Branches/Plant	
	2014-15	2015-16	2014-15	2015-16	2014-15	2015-16
Intercropping						
Sesame + Maize (4:1)	-	-	-	-	-	-
Sesame + Maize (8:2)	-	-	-	-	-	-
Sesame + Urd (4:1)	29.24	29.71	78.04	77.78	7.39	7.69
Sesame + Urd (8:2)	33.21	33.69	89.25	89.83	8.55	9.24
SE(d)±	**0.677**	**0.684**	**1.745**	**1.690**	**0.306**	**0.356**
CD at 5%	**1.442**	**1.485**	**3.721**	**3.602**	**0.653**	**0.759**
Weed Management						
Hand Weeding	32.48	32.93	88.46	87.71	8.73	8.95
Pendimethalin 30% EC @ 3.0L/ha.	29.75	30.04	80.10	80.51	7.35	7.96
Alachlor 50% EC @0.750kg/ha.	31.46	32.14	82.38	83.22	7.82	8.50
SE(d)±	**0.829**	**0.838**	**2.138**	**2.069**	**0.375**	**0.436**
CD at 5 %	**1.766**	**1.785**	**4.557**	**4.411**	**0.800**	**N.S.**

Table.4 Mean table for grain weight/pod (g), pods weight/plant (g) and grain weight/plant (g) of urd crop during the two years.

Treatments	Mean Table					
	Grain Weight/Pod (g)		Pods Weight/Plant (g)		Grain Weight/Plant (g)	
	2015	2016	2015	2016	2015	2016
Intercropping						
Sesame + Maize (4:1)	-	-	-	-	-	-
Sesame + Maize (8:2)	-	-	-	-	-	-
Sesame + Urd (4:1)	0.24	0.25	8.05	8.47	4.78	5.60
Sesame + Urd (8:2)	0.25	0.27	9.87	10.57	6.78	7.57
SE(d)±	**0.027**	**0.028**	**0.501**	**0.701**	**0.444**	**0.460**
CD at 5%	**N.S.**	**N.S.**	**1.067**	**1.494**	**0.946**	**0.981**
Weed Management						
Hand Weeding	0.28	0.30	16.65	17.46	10.24	10.35
Pendimethalin 30% EC @ 3.0L/ha.	0.21	0.22	4.69	5.19	3.26	3.70
Alachlor 50% EC @0.750kg/ha.	0.25	0.26	5.55	5.92	3.76	5.71
SE(d)±	**0.033**	**0.034**	**0.613**	**0.859**	**0.544**	**0.563**
CD at 5 %	**N.S.**	**N.S.**	**1.307**	**1.830**	**1.159**	**1.201**

Table.5 Mean table for grain/pod pod/plant and test weight (g) of urd crop during the two years.

Treatments	Mean Table					
	Grain/pod		Pod/Plant		Test Weight (g)	
	2014-15	2015-16	2014-15	2015-16	2014-15	2015-16
Intercropping						
Sesame + Maize (4:1)	-	-	-	-	-	-
Sesame + Maize (8:2)	-	-	-	-	-	-
Sesame + Urd (4:1)	6.08	9.83	26.97	32.72	30.38	31.35
Sesame + Urd (8:2)	6.58	10.61	30.72	35.23	32.86	34.48
SE(d)±	**0.329**	**0.441**	**0.982**	**1.148**	**0.947**	**1.115**
CD at 5%	**N.S.**	**N.S.**	**2.092**	**2.448**	**2.019**	**2.377**
Weed Management						
Hand Weeding	6.84	11.80	39.39	48.59	33.81	34.92
Pendimethalin 30% EC @ 3.0L/ha.	5.71	8.21	21.71	23.79	29.34	30.44
Alachlor 50% EC @0.750kg/ha.	6.46	10.67	25.44	29.56	31.72	33.38
SE(d)±	**0.403**	**0.540**	**1.202**	**1.407**	**1.160**	**1.366**
CD at 5 %	**0.859**	**1.151**	**2.563**	**2.998**	**2.472**	**2.911**

Among the weed management practices, the application of hand weeding received significantly higher pod/plant than *pendimethalin* and *alachlor* which was maximum with (81.44 and 104.25 %) and (54.83 and 64.38 %), respectively over *pendimethalin* and *alachlor* application of weed management practices during the two years of study.

Interaction effect of intercropping and weed management practices did not reach significantly on pod/plant during the two years of experimentation.

Test weight (g)

Test weight (g) under different treatments has been presented in table 5. Test weight of urd was recorded significantly highest with the intercropping of sesame + urd (8:2) (32.86 and 34.48 g) as compared to sesame + urd (4:1) (30.38 and 31.35 g), respectively during the two years of study. Among the weed management practices, the application of hand weeding received significantly higher test weight than *pendimethalin* and *alachlor* which was maximum with 15.24 and 14.72 % as well as 6.59 and 4.61 %, respectively over *pendimethalin* and *alachlor* application of weed management practices during the two years of study. Interaction effect of intercropping and weed management practices did not reached significantly on test weight (g) during the two years of experimentation.

The yield attributes significant by increased with increased row ration of maize/urd planting. The reason of improvement in yield

components of associated sesame crop with maize/urd may be explained by availability of more plant nutrients in soil enhanced the growth led to increase in photosynthesis which resulted improvement in yield attributes of intercrop under sesame with maize. Similar results are reported by Tomar *et al.,* (2020); Rajiv and Singh (2018), Yadav *et al.,* (2013), Ashokaet *et al.,* (2013) and El-Deinet *et al.,* (2015).

The increase in yield attributes in hand weeding may also be attributed to proper increase in availability of nutrients, water, light and space to crops as a result of effective weed management. However, almost weed free condition enabled the crop plants to grow vigorously accumulated more dry matter and produced more cobs/plant and 100 seeds weight. These finding are corroborated with Kumar *et al.,* (2005), Pardeshiet *et al.,* (2008) and Dwivedi *et al.,* (2012).

It could be concluded that urd bean as an intercrop with sesame is much desirable for yield attributing parameters and hand weeding in plots is much more desirable than other weedicides.

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