RESEARCH ARTICLE

STUDY ON EFFECTS OF WEED MANAGEMENT PRACTICES ON MONETARY ADVANTAGES AND QUALITY OF SESAME BASED INTERCROPPING WITH *KHARIF* SEASON CROPS

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Abstract: 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 Pandimethaline 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. The all weed flora were counted significantly lowest, in treatment of sesame + urd (8:2) inter cropping composed to remaining intercropping treatment during both the years, respectively. The grain yield of sesame was significantly higher produced in sesame + urd (8:2) treatment over other rest treatment during 2015 and 2016 years, respectively.The grain yield of maize and urd intercrops with sesame in 8:2 row ratio was statistically higher produced than 4:1 row ratio during both the years except urd intercrop in second year only. The monetary benefits of main crop (sesame) was recorded significantly more with sesame + urd (8:2) inter cropping over used rest intercropping during both the years, respectively. The intercropping of sesame + urd (8:2) were found significantly higher quality parameters viz., protein and oil content over sesame + maize (4:1), sesame + maize (8:2) and sesame + urd (4:1) intensively during both the years, respectively. The hand weeding practice was significantly reduced weed populations, over chemical weed management practices as pre-emergence of Pendimethaline and early post emergence of Alachlor, respectively during both years. The response of weed management practices was significantly noted in hand weeding practice in respect to grain yield of main crop (sesame) and sub crop (Maize and urd) over applied chemical weedicides as pendimethaline and Alachlor during both the years, respectively. The monetary advantages viz., system of productivity and profitability and quality aspects viz, protein and oil content with hand weeding practice were significantly more than applied both chemical control of pendimethaline and Alachlors in both the years, respectively. Therefore, inter cropping sesame + ured (8:2) with hard weeding practice may be recommended in respect to all weed populations reduced more produced grain yield of main and sub crop monetary advantages and quality aspects.

Keywords: Weed management, Crops, *Kharif*, Treatment

INTRODUCTION

Sesame is most widely grown oilseed crop of the world which belongs to family pedaliaceae. It contains 48.52% oil, 20-25% protein & 14-20% corbohydrate. Seed of sesame has pronounced antioxidant activity and thereby offer higher shelf life and it is called as "seeds of mortality". The oil of sesame is used for cooking baking, making soaps, lubricant, hair treatment, point, perfumery products and drugs (As a drugs it is used for controlling of stress, tension and blood pressure). It leaves are used for vegetable soups, in African countries its seeds are used when fried and mixed with sugar. While stems are used for making paper, fuel and source of potash after burning.Intercropping is the system of management of crop which involves growing of two or more than two species of different crop in distinct weed management on the same piece of land. Intercropping system legumes & cereals areinvolved which have many processes such as competitive and complimentary to the components of crops.Day by day due to rapid increase in the population the demand for food grain production also increased rapidly. Many farmers grow more food gram crop to fulfill the increasing the food demand of population even then it is not grown up belong farmers grow single crop at a time or adopt mono-cropping because. Growing of two or more than two crops or adopting intercropping system increases their cost of cultivation which is not affordable by marginal farmers. Maize (*Zea Mays L.*) crop produced throughout the country under diverse environment conditions. Higher maize production depends upon the correct applications of production inputs which sustain the environment as well as agricultural production.Urd bean or black gram (*vigna mungo* L.) is an important pulse crop of India. As well as Kharif bonus crop. Urd bean used in the form of 'dal' in the country. Therefore experiments of crops like sesame, maize and urdbean were evaluated for their sustainability for intercropping system under weed management practices of Central U.P.

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MATERIAL AND METHOD

A field experiments was laidout at Students Instructional Farm of C.S. Azad University of Agriculture and Technology, Kanpur-208002 (UP) during *Kharif* season of 2015 and 2016 on entitled "Study of Effects of Weed Management Practices on Monetary advantages and quality of sesame weed management practices on monetary advantages and quality of sesame based intercropping with Kharif seasons crops. The experiment comprising of twelve treatments were laid out in a Factorial Randomized Block Design with 4 replications. 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 Pandimethaline 30% EC@3.0 L/ha and Early post-emergence of Alachlor 50% EC@ 0.75 kg/ha replicated four times.The soil of the experiment field was sandy loam in texture with pH of 7.58 and EC of 0.20 mmhos/m at 25□ C. The sown of 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 experiment. Seed rate of sesame @ 5 kg/ha, maize @ 20 kg/ha and urd @ 16 kg/ha. were sown, row to row spacing for sesame is 30 cm & 10 cm for urd crop and 35 cm for maize crop were done by country plough on date 13.07.2015 and 15.07.2015 at intercropping row ratio and weed management practices as per treatments. The crops harvested were done by soils maturity on 28.09.2015 and 30.09.2016 of Urd crop, 07.10.2015 & 08.10.2016 of maize crop and 24.10.2015 and 28.10.2016 of sesame crop. Recommended dose of fertilizer was used in the study years.

RESULT AND DISCUSSION

STUDIES ON INTERCROPPING SYSTEMS

Effect on weed flora

The intercropping of urd with seasame crop of 8:2 row ratio were significantly reduced all weed flora viz, *sorghum helepence, Anagalis arvensis, cyperus rotunches, digeraarversis, carnopus, didymus, parthenium hystrophorus and chenopsodium murale*over sesame + maze (4:1), sesame + maize (8:2) and sesome + urd (4:1) intercropping, respectively during both the years. However, the maximum number of weeds as weed flora were observed with sesame + maize (4:1) in both years. The percentage reduction of sesame + urd (8:2) over sesame + maize (4:1) were 17.45 of sorghum helepense, 31.68 of anagallis aversis, 29.27 of cyperus rotundus, 27.45 digera arvesis, 38.50 of cornopus didymus, 53.58 of parthenium hystrophorus and 39.26 of chenopodium murale on the basis of mean data, respectively. The highest weed flora was recorded in sesame + maize (4:1) intercropping system. It might be due to sesame intercropped with pulses suppressed the weed flora. These findings are in conformity with those reported by Nazir *et al.* (2002), Sullivan *et al.* 2003, Prins *et al.* (2005),Nasri *et al.* (2014), Gao *et al.* (2014) and Hailu et al. *(2015).*

Effect on grain yield of sesame with maize and urd intercrops

The grain yield of sesame was significantly higher recorded in sesame + urd (8:2) intercropping over remaining all intercropping systems, respectively during 2015 and 2016 years. The maximum grain yield of sesame was recorded with sesame + urd (8:2) in both the years due to reason of lowest weed florathe increase in the seed of sesame with pulses intercropping may be attributed to better vegetative growth and increased in yield attributes finally in this treatments. On an average it improve the grain yield by a margin of 0.73 q/ha (21.09%), 0.56 q/ha (15.43%) and 0.45 q/ha(12.03%) over sesame + maize (4:1), sesame + maize (8:2) and sesame + urd (4:1) inter cropping, respectively. The results are supported by the findings of Hanuman Thappa *et.al* (2008), Ashoka et al. (2013) and Ijoyah *et al.* (2015). Maize and urd intercrops were not significant effect on grain yield in both years of study. But grain yield in 8:2 row ratio were statistically were observed compared to 4:2 row ratio in both inter crops in present study. Such intercropping yields are attributed to more plant population of intercrops. In other words, lesser plant populations attributes in intercropping systems resulted lower yields of intercrops. Similar results are confirmed with Yadav *et al.* (2008), Ashoka *et al.* (2013) and Ijoyah *et al.* (2015).

Effecton monetary advantages

The system productivity of monetary advantages was significantly increased in intercropping of sesame + urd (8:2) compared to rest intercropping treatments during both the years. The minimum system productivity was recorded with sesame + maize (4:1) in both the years. On the mean basis system productivity of sesame + urd (8:2) by a margin of (0.26 kg/ha/day), (24.07%) 0.27,(kg/ha/day, (25.23%) and 0.19 kg/ha/day (16.52%). Over sesame + maize (4:1), sesame + maize (8:2) and sesame + urd (4:1) treatments, respectively. The intercropping of sesame + urd. (8:2) were significantly improved system profitability than 4:1 and 8:2 row ratio of sesame + maize and sesame + urd (4:1) inter cropping during both the years with percentage incrementsover sesame + maize (4:1) of 51.13, sesame + maize (8:2) of 39.92 and sesame + urd (4:1) of 24.42 on mean basis, respectively. The higher benefits are attributed to higher yield and higher market price of component crop. Inclusion of urd and maize as an intercrops with sesame (8:2) ratio is more profitable and stable in comparision to other sequences. These findings are in close confirmity with the results reported by Rathi *et al.* (2012), Yadav *et al.* 2013 and Ashoka *et al.* (2013).

Effect on quality parameters

The used intercropping systems exerted a positive effect on protein content in sesame + urd (8:2) in both years with a margin of 2.49%, 1.16% and 0.70% over sesame + maize (4:1), sesame + maize (8:2) and sesame + urd (4:1) on mean basis, respectively. It is clear from the result that intercropping which the oil content significantly increased with sesame + urd (8:2) over sesame + maize (4:1), sesame + maize (8:2) and sesame + urd (4:1) in both years. It was increased on the mean basis a tune of 47.90%, 32.82% and 19.87% over rest intercropping treatments, respectively. This is because the seed yield was recorded higher under the same treatments. Similar type of results was also found by Nurbakhsh *et al.* (2013) and El-Dein *et al.* (2015).

STUDIES ON WEED MANAGEMENT PRACTICES

Effect of weed management practices in weed flora:

The perusal of the data: clearly indicated that the hand weed management practices affected significantly in respect of weeds viz., sorghum holepense, anagallis, arvensis, cyperus rotundus, Digera arvensis, cornopus, dihymus, parthenium hysteropporus and chenopodiummurale over the used chemical weed management practices (Pendimethalime & Alochlor) during both the years. The percentage reductions of hand weeding practices over Pendimethalime 30% EC @ 3.0 L/ha and Alachlor 50% EC@0.75 kg/ha were 63.45 and 29.44 of sorghum helepense, 39.21 and 13.58 of Anagallis arvensis, 88.75 & 20.42 of cyperus rotundus, 94.90 and 44.90 of Digera arvensis, 81.72 and 28.97 of cornopus didymus, 87.28 and 46.93 of parthenium hystrophorus and 137.39 and 33.04 of chenopodium murale on the basis of meandata, respectively. It might be due to hand weeding and alachlor application are more responsible against weed flora as compared to other practices. Similar results are also reported by Mathukia *et al.* (2015) and Mruthul *et al.* (2015).

Effect on grain yield of sesame with maize and urd intercrops

The result revealed that the significant response to use of weed net management practices was observed at hand weeding practices in respect of grain yield of sesame in both years with percentage increments over use of chemical weed management practices as pendimathaline of 26.43% and alochlor of 13.48% on average, respectively. The grain yield of maize was recorded significantly higher in hard weeding as compared to weedicides as pendimethaline and alochlor during the two year of study. The grain yield of maize in intercrop with increments of the percentage were (25.33%) from pendimethalime and (14.07%) from alochlor on an average, respectively. In the weed management practices, the hard weeding received significantly highest grain yield as compared to pendimethalime and alochlor during the two years which was more with 27.50% and 16.79% over pendimethaline and alcholar application of chemical weed management practices on the basis of mean data, respectively. These superior treatments kept the crop almost hand. Weeding which in turn resulted to significant reduction in competition for nutrients and other growth resources by weeds, as a consequence of which reduction in weed dry matter and nutrient depletion by weeds was obtained. Grichar et al. (2007) reduced crop-weed competition under these treatments saved a substantial amount of nutrients for crop that led to profuse growth, enabling the crop to utilize more soil moisture and nutrients from deeper soil layers.

Effect on monetary advantages

The result revealed that the hand weeding practices increased the monetary advantages viz., system of productivity and profitability significantly over the application of pre-emergence pendimethaline and early post-emergence alochlor in both years, respectively. The percentage increments of hand weeding practices over pendimethaline and alochlor were 17.43 and 9.00 in productivity system and 63.89 and 20.55 in profitability system on an average, respectively. This might be due to increase in yields of sesame crop in diminishing manner under the weed management practices. These results corroborate the findings of Bhatt *et al.* 2010 and Pusadkar *et al.* 2015.

Effect on quality aspects

The practices of weed management increased the quality parameters viz protein and oil content in grain of sesame crop significantly at hand weeding over use of weedicides of pendimethaline and alcholor in both the years, respectively. These treatments were found significantly superior and gave significantly higher protein content (1.43% and 0.66%) and oil content (37.7% and 14.42%) over pendimethalin and alochlor, respectively.Oil and protein yield is directly related to the yield of the crop which is mainly due to the presnence of weed free environment till harvest, resulting into the reduced crop weed competition and increase in seed yield of the crop. The result of the present study are in close conformity with the findings of Bawa *et al.* (2015) and Chhetri *et al.* (2015).

Effect of Weed Management Practices on weed population, system of productivity and profitability and quality of sesame based intercropping with *Kharif* season crops

Table 1. Effect of treatments on Plant Height at maturity of sesame, maize and urd (cm), test weight of sesame, maize and urd (g) of the crops.

Intercropping	Mean table																	
	Plant height at maturity of sesame (cm)			Plant height at maturity of maize (cm)			Plant Height at maturity of urd (cm)			Plant height at maturity of sesame (g)			Plant height at maturity of maize (g)			Plant Height at maturity of urd (g)		
	2015	2016	Mean	2015	2016	Mean	2015	2016	Mean	2015	2016	Mean	2015	2016	Mean	2015	2016	Mean
Sesame + Maize (4:1)	112.52	123.15	117.84	40.38	43.06	41.72	-	-	-	3.23	3.27	3.25	22.66	23.04	22.85	-	-	-
Sesame + Maize (8:2)	120.40	121.23	120.82	41.54	50.29	45.92	-	-	-	3.35	3.41	3.38	23.03	23.20	23.12	-	-	-
Sesame + Urd (4:1)	128.92	126.99	127.96	-	-	-	38.55	40.68	39.42	3.49	3.52	3.51	-	-	-	30.38	31.35	30.87
Sesame + Urd (8:2)	130.50	131.12	130.81	-	-	-	40.66	44.22	42.44	3.70	3.77	3.74	-	-	-	32.86	34.48	33.67
SE(d) ±	**2.301**	**2.132**	**-**	**1.513**	**1.719**	**-**	**1.295**	**1.515**	**-**	**0.109**	**0.116**	**-**	**0.850**	**0.848**	**-**	**0.947**	**1.115**	**-**
CD at 5%	**4.684**	**4.339**	**-**	**N.S**	**3.664**	**-**	**NS**	**3.230**	**-**	**0.221**	**0.237**	**-**	**NS**	**NS**	**-**	**2.019**	**2.377**	**-**
Weed Management Practices																		
Hand Weeding	127.33	134.58	130.96	46.49	55.09	50.79	43.97	46.20	45.09	3.61	3.64	3.63	24.52	24.77	24.65	33.81	34.92	34.37
Pendimethaline30%EC@3.0L/ha	118.46	119.69	119.08	37.54	42.39	39.97	33.14	38.66	35.90	3.28	3.35	3.32	21.08	21.41	21.25	29.34	30.44	29.89
Alachlor 50%EC@0.750kg/ha	123.47	122.61	123.04	38.85	42.54	40.70	41.71	42.49	42.10	3.43	3.49	3.46	22.94	23.18	23.06	31.72	33.38	32.55
SE(d)±	**1.99**	**1.846**	**-**	**1.853**	**2.105**	**-**	**1.586**	**1.856**	**-**	**0.094**	**0.101**	**-**	**1.041**	**1.039**	**-**	**1.160**	**1.366**	**-**
CD at 5 %	**4.056**	**3.758**	**-**	**3.950**	**4.488**	**-**	**3.382**	**3.956**	**-**	**0.192**	**0.205**	**-**	**2.219**	**2.214**	**-**	**2.472**	**2.911**	**-**

Table 2. Effect of treatments on man table for no. of weeds/plot of the weeds during both the years.

Intercropping	Mean table																				
	Sorghum helepence			Anagallis arvensis			Cypenrus rotundus			Digera arvensis			Cornopus didymus			Parthenium hystrophorus			Chenopodium murale *L.*		
	2015	2016	Mean	2015	2016	Mean	2015	2016	Mean	2015	2016	Mean	2015	2016	Mean	2015	2016	Mean	2015	2016	Mean
Sesame + Maize (4:1)	2.67	2.85	2.76	3.38	3.51	3.45	3.64	3.78	3.71	3.22	3.28	3.25	4.54	4.61	4.58	4.01	4.12	4.07	4.09	4.21	4.15
Sesame + Maize (8:2)	2.56	2.58	2.57	2.87	3.04	2.96	3.27	3.40	3.34	2.80	2.92	2.86	4.09	4.04	4.07	3.26	3.42	3.34	3.75	3.89	3.82
Sesame + Urd (4:1)	2.58	2.70	2.64	2.93	3.06	3.00	3.07	3.25	3.16	2.76	2.88	2.82	3.79	3.90	3.85	3.07	3.19	3.13	3.42	3.53	3.48
Sesame + Urd (8:2)	2.32	2.38	2.35	2.57	2.67	2.62	2.77	2.96	2.87	2.49	2.60	2.55	3.33	3.43	3.38	2.58	2.71	2.65	2.92	3.03	2.98
SE(d) ±	**0.112**	**0.149**	**-**	**0.194**	**0.263**	**-**	**0.244**	**0.224**	**-**	**0.198**	**0.173**	**-**	**0.223**	**0.235**	**-**	**0.291**	**0.238**	**-**	**0.261**	**0.269**	**-**
CD at 5%	**0.227**	**0.304**	**-**	**0.395**	**0.536**	**-**	**0.496**	**0.456**	**-**	**0.403**	**0.352**	**-**	**0.454**	**0.479**	**-**	**0.592**	**0.483**	**-**	**0.530**	**0.547**	**-**
Weed Management Practices																					
Hand Weeding	1.93	2.01	1.97	2.35	2.51	2.43	2.29	2.50	2.40	1.89	2.02	1.96	2.83	2.97	2.90	2.20	2.36	2.28	2.24	2.36	2.30
Pendimethaline30%EC@3.0L/ha	3.16	3.27	3.22	3.77	3.89	3.83	4.47	4.59	4.53	3.77	3.86	3.82	5.30	5.23	5.27	4.21	4.32	4.27	5.43	5.49	5.46
Alachlor 50%EC@0.750kg/ha	2.50	2.60	2.55	2.71	2.81	2.76	2.81	2.96	2.89	2.79	2.89	2.84	3.68	3.79	3.74	3.29	3.41	3.35	2.97	3.14	3.06
SE(d)±	**0.097**	**0.129**	**-**	**0.168**	**0.228**	**-**	**2.11**	**0.194**	**-**	**0.172**	**0.150**	**-**	**0.193**	**0.204**	**-**	**0.252**	**0.206**	**-**	**0.226**	**0.233**	**-**
CD at 5 %	**0.197**	**0.263**	**-**	**0.342**	**0.464**	**-**	**0.429**	**0.395**	**-**	**0.349**	**0.305**	**-**	**0.393**	**0.415**	**-**	**0.513**	**0.419**	**-**	**0.459**	**0.474**	**-**

Table 3. Effect of treatments on man table for grain yield of sesame, maize & system productivity, system profitability (Rs/ha/day), protein & oil content (%).

Intercropping	Sesame Crop Grain yield (q/ha)			Maize Crop Grain yield (q/ha)			Urd Crop Grain yield (q/ha)			System Productivity (Rs/ha/day)			System Profitability (Rs./ha/day)			Protein Content (%)			Oil Content (%)		
	2015	2016	Mean	2015	2016	Mean	2015	2016	Mean	2015	2016	Mean	2015	2016	Mean	2015	2016	Mean	2015	2016	Mean
Sesame + Maize (4:1)	3.52	3.39	3.46	3.29	3.27	3.28	-	-	-	1.09	1.07	1.08	48.58	48.66	48.62	10.11	10.25	10.18	143.11	144.99	144.05
Sesame + Maize (8:2)	3.75	3.50	3.63	3.49	3.50	3.50	-	-	-	1.06	1.08	1.07	53.51	51.01	52.26	11.44	11.57	11.51	157.21	161.04	159.13
Sesame + Urd (4:1)	3.95	3.52	3.74	-	-	-	1.29	1.22	1.26	1.26	1.04	1.15	63.06	55.05	59.06	11.90	12.04	11.97	170.03	174.13	172.08
Sesame + Urd (8:2)	4.37	4.00	4.19	-	-	-	1.44	1.40	1.42	1.37	1.31	1.34	76.05	70.90	73.48	12.60	12.73	12.67	190.87	193.03	191.95
SE(d) ±	**0.191**	**0.147**	**-**	**0.208**	**0.172**	**-**	**0.078**	**0.097**	**-**	**0.051**	**0.070**	**-**	**1.269**	**1.475**	**-**	**0.065**	**0.116**	**-**	**3.298**	**3.976**	**-**
CD at 5%	**0.389**	**0.299**	**-**	**N.S.**	**N.S.**	**-**	**N.S.**	**N.S.**	**-**	**0.104**	**0.142**	**-**	**2.582**	**3.002**	**-**	**0.131**	**0.237**	**-**	**6.712**	**8.092**	**-**
Weed Management Practices																					

Hand Weeding	4.18	4.23	4.21	3.83	3.78	3.81	1.59	1.47	1.47	1.26	1.29	1.28	68.76	74.74	71.75	12.19	12.36	12.28	183.45	184.91	184.18
Pendimethaline30%EC@3.0L/ha	3.54	3.11	3.33	3.00	3.08	3.04	1.21	1.18	1.18	1.10	1.08	1.09	48.24	39.32	43.78	10.78	10.91	10.85	144.30	148.64	146.47
Alachlor 50%EC@0.750kg/ha	3.95	3.47	3.71	3.36	3.31	3.34	1.31	1.30	1.30	1.22	1.15	1.19	63.89	55.15	59.52	11.56	11.67	11.62	168.17	171.35	169.76
SE(d)±	**0.165**	**0.127**	**-**	**0.255**	**0.211**	**-**	**0.096**	**0.083**	**0.083**	**0.044**	**0.060**	**-**	**1.099**	**1.278**	**-**	**0.056**	**0.101**	**-**	**2.856**	**3.444**	**-**
CD at 5 %	**0.337**	**0.259**	**-**	**0.544**	**0.449**	**-**	**0.205**	**0.176**	**0.176**	**0.090**	**0.123**	**-**	**2.236**	**2.600**	**-**	**0.114**	**0.205**	**-**	**5.813**	**7.008**	**-**

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