



Weed indices in chickpea + mustard intercropping system

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ABSTRACT

A field experiment consisted of four intercropping systems, viz. sole chickpea, sole mustard, chickpea + mustard (additive series) and chickpea + mustard (replacement series) and six weed management practices, viz. weedy check, weed free, pendimethalin 1 kg/ha as pre-emergence, fluchloralin 1 kg/ha as pre-plant incorporation (PPI), isoproturon 0.75 kg/ha as post-emergence and quizalofop-ethyl 50 ml/ha as post-emergence. Results revealed that weed species, *Medicago sativa*, *Anagallis arvensis* and *Cyperus rotundus* with higher relative weed density and dry weed weight were observed. The values of smothering efficiency were higher in additive as compared to replacement treatment. Maximum yield loss was in weedy check in comparison to weed-free plots. Application of pendimethalin at 1 kg/ha gave higher yield of chickpea and mustard along with maximum returns.

Key words: Intercropping, Relative weed density, Relative dry weed weight, Weed smothering efficiency, economic returns

Intercropping systems suppress weeds better than sole cropping, and provide an opportunity as tools of weed management. Besides, intercropping also reduces weeding cost and realizes higher total productivity of the system and monetary returns. Herbicidal weed management is in vague for most of the individual crops but in case of intercropping situations, the single crop recommendations do not hold good as the crop vs crop and crops vs weeds scenarios change drastically. No single method provides efficient weed management in chickpea + mustard intercropping system. The use of herbicides offers a good scope for timely and adequate control of weeds. Efficiency of weed control can be further enhanced if herbicidal treatments are coupled with intercropping, which plays a very significant role in suppression of weeds through their smothering effect. Chickpea is a poor competitor to weeds because of its slow growth and limited leaf area development at early stages of crop growth and establishment. Therefore, intercropping of mustard in chickpea coupled with effective weed control measures may help to realize the potential yield of chickpea with an additional yield of mustard.

MATERIALS AND METHODS

A field experiment was conducted at the Research Farm, Main Campus, Chatha of Sher-e-Kashmir University of Agricultural Sciences and Technology of Jammu during *Rabi* season of 2009-10 and 2010-11. The experimental soil was sandy-loam in texture,

slightly alkaline in reaction, medium in organic C and available N, P and K. The experiment consisted of four intercropping systems, viz. sole chickpea (30 cm), sole mustard (30 cm), chickpea + mustard in additive series (an additional row was opened in between two rows of chickpea for sowing of mustard in additive series), and chickpea + mustard in replacement series (one row of chickpea was replaced with one row of mustard); and six weed management practices, viz. weedy check, weed free, pendimethalin 1 kg/ha as pre emergence (PE), fluchloralin 1 kg/ha as pre-plant incorporation (PPI), isoproturon 0.75 kg/ha as post-emergence (POE) and quizalofop-ethyl 50 ml/ha as post-emergence (POE) in a split-plot design with three replications. Furrows were opened manually with the help of liners at a specified row to row distance of 30 cm. The chickpea '*GNG-469*' and mustard '*RSPR 01*' were sown on 5 November 2009 and 31 October 2010, respectively. A seed rate of 70 kg and 5 kg/ha for chickpea and mustard was used in their sole plots and additive series, respectively, while 50% less seed was used for replacement series. Sowing was done in furrows by 'kera' method in sole stand, whereas an additional row was opened in between two rows of chickpea for sowing of mustard. Full dose of DAP as recommended for chickpea was applied as basal.

Weed population and weeds dry weight was recorded at 30 days interval and at harvest. The weed indices, viz. weeds smothering efficiency, relative weed density, relative dry weeds weight and summed dominance ratio were calculated.

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RESULTS AND DISCUSSION

Weed indices

The experimental site was infested with broad-leaved weeds (*Medicago sativa*, *Anagallis arvensis* and *Trachyspermum* spp.), followed by sedges (*Cyperus rotundus*) and grasses (*Cynodon dactylon* and *Poa annua*). Among the broad-leaved weeds, *Medicago sativa* was found to be the most dominant weed at 60 days after sowing and at harvest, which was followed by *Anagallis arvensis* and *Trachyspermum* spp. Among the grassy weeds, the infestation was dominated by *Cynodon dactylon*, followed by *Poa annua* and in the sedges category, *Cyperus rotundus* was found to be the only dominant weed. *Medicago sativa* accumulated higher dry matter, followed by *Anagallis arvensis* and *Trachyspermum* spp. at 60 DAS and at harvest (Table 1). Among the grassy weeds, *Cynodon dactylon* was followed by *Poa annua* in accumulating more dry matter at 60 DAS and harvest, whereas *Cyperus rotundus* recorded relatively higher weed dry matter among all the weed species under weedy situation. The most dominant weed species were ranked on the basis of their summed dominance ratio, and followed the order: *Medicago sativa* > *Anagallis arvensis* > *Cyperus*

rotundus > *Trachyspermum* spp. > *Cynodon dactylon*. *Medicago sativa* was the top ranking dominant weed, followed by *Anagallis arvensis*.

Higher weed smothering efficiency was registered in additive as compared to replacement treatment (Table 2). This might have happened due to suppressed weed demography as a result of less availability of resources like space and light induced by competitive environment created by the overwhelming canopy of crop plants in a unit area which prevented the weeds to flourish and attain interfering growth in additive treatments. These findings were in close conformity with Shah *et al.* (2011).

Economics

Cost of cultivation varied due to the differences in the cost of seeds of chickpea and mustard, and weed management practices. Evidently, the lowest cost of cultivation was realized under weedy check. The highest net returns were obtained under additive treatment, followed by replacement treatment over sole chickpea and mustard. Tripathi *et al.* (2005) reported similar findings in respect of net returns in chickpea + mustard intercropping system.

Table 1. Relative dry weed weight and summed dominance ratio as encountered in weedy check

Treatment	Relative weed dry weight (%)				Summed dominance ratio			
	60 DAS		At harvest		60 DAS		At harvest	
	2009-10	2010-11	2009-10	2010-11	2009-10	2010-11	2009-10	2010-11
<i>Broad-leaf weeds</i>								
<i>Medicago sativa</i>	31.1	32.8	26.2	28.2	32.8	34.3	29.7	31.4
<i>Anagallis arvensis</i>	24.5	25.8	20.7	22.1	25.9	26.9	23.4	24.6
<i>Trachyspermum</i> sp.	6.0	5.08	7.85	7.4	4.8	4.0	6.1	5.7
<i>Grasses</i>								
<i>Cynodon dactylon</i>	1.1	1.2	2.2	2.1	1.0	1.1	1.9	1.8
<i>Poa annua</i>	1.1	1.2	1.4	1.2	1.0	1.1	1.2	1.0
<i>Sedges</i>								
<i>Cyperus rotundus</i>	19.1	19.9	14.1	14.9	20.2	20.8	16.0	16.6
Others	16.8	13.9	27.2	23.8	13.9	11.4	21.4	18.6

Table 2. Periodic weeds smothering efficiency (%) as influenced by different intercropping treatments

Intercropping system	30 DAS		60 DAS		90 DAS		120 DAS		At harvest	
	2009-10	2010-11	2009-10	2010-11	2009-10	2010-11	2009-10	2010-11	2009-10	2010-11
	Chickpea + mustard (additive series)	29.4	30.7	23.3	28.6	20.6	24.3	18.9	22.2	20.2
Chickpea + mustard (replacement series)	15.0	19.0	11.9	14.6	10.5	12.4	10.0	11.3	3.20	4.00

Table 3. Influence of intercropping system and weed management practices on economics

Treatment	Cost of cultivation (x10 ³ /ha)		Gross returns (x10 ³ /ha)		Net returns (x10 ³ /ha)	
	2009-10	2010-11	2009-10	2010-11	2009-10	2010-11
<i>Intercropping</i>						
Sole chickpea	14.74	14.37	25.07	26.47	10.32	12.10
Sole mustard	11.12	11.15	23.20	24.13	12.07	12.98
Chickpea + mustard (additive Series)	15.40	15.05	38.13	41.16	22.73	26.10
Chickpea + mustard (replacement Series)	12.93	12.76	29.59	33.28	16.66	20.52
<i>Weed management</i>						
Fluchloralin 1 kg/ha (PPI)	12.04	11.82	27.87	34.03	15.84	22.20
Pendimethalin 1 kg/ha (PE)	12.86	12.64	30.17	36.09	17.31	23.44
Isoproturon 0.75 kg/ha (POE)	11.64	11.42	24.54	31.21	12.91	19.79
Quizalofop-ethyl 50 g/ha (POE)	12.96	12.75	27.04	32.70	14.08	19.96
Weedy check	11.24	11.02	15.42	14.33	4.18	13.22
Weed free	20.56	20.35	32.69	39.20	12.12	18.85

It can be concluded that chickpea + mustard in additive treatment is the most promising intercropping system for resource rich farmers of Jammu region. However, for realizing higher returns, chickpea + mustard in replacement treatment can be recommended to resource-poor farmers. Pendimethalin as pre-emergence 1 kg/ha followed by fluchloralin as pre-plant incorporation 1 kg/ha can be recommended for efficient weed management practices in chickpea + mustard intercropping system under the sub-tropical conditions of Jammu.

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