Short communication

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Comparative efficacy of quizalofop-ethyl against weeds in groundnut

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Groundnut production is as high as 35,367 MT in world, the production in India is about 5,500 MT which is traceable to weed infestation (www.cnagri.com). Unmanaged weeds from groundnut crop results in yield loss as high as 60% to 80% Ikisan (2000). In groundnut, less crop canopy during the first 6 weeks of crop growth favours strong competition with weeds causing significant reduction in yield. Therefore, timely and effective weed control during this critical period of crop weed competition become necessary for attaining maximum yield (Etejere *et al.* 2013).

Manual weeding which is the age long practice for weed control in this crop is very laborious, time consuming and expensive most importantly when there is dearth of manpower. Use of chemical herbicides is the best possible alternative over the manual weeding and inter culture operations. It has also been recommended that there should be no intercultural operations applied at pegging stage of the crop (45 days after sowing). Chemical herbicide and cultural methods are effective to control the weeds in groundnut crop (Patel *et al*. 1997). Hence, the application of post-emergence herbicides shall be more useful in controlling the weeds. The present study aimed to find out the effective and economic use of post emergence herbicides to control the grassy weeds in groundnut crop.

A field experiment was conducted during *Kharif* season of 2012 at Norman E. Borlaug, Crop Research Center of GBPUA&T, Pantnagar to evaluate the efficacy of quizalofop-ethyl at various doses as sponsor sample (SS) over the available market sample (MS) against the complex weed flora in groundnut under foothill of Uttarakhand state. Sowing of groundnut variety "*Chandra*" was done manually on June 28, 2012 with a row spacing of 30 cm apart. The experiment was laid out in randomized block design with three replication. The seven weed control treatments consisted of two different doses of (quizalofop-ethyl) sponsor sample (SS) as well as market sample (MS) 5% EC applied at 37.5 and 50 g/ha, imazethapyr 10% SL at 150 g/ha as standard check, weed free and weedy check were maintained till harvest. Post-emergence application of herbicides (imazethapyr and quizalofop-ethyl) were applied uniformly at 20 DAS (days after sowing) by using a spray volume of 500 L/ha with the help knapsack sprayer fitted with flat fan boom nozzle. The crop was fertilized with 20:30:45 kg NPK, respectively. Total weed density and dry matter accumulation of weeds were recorded at 45 DAS. Weed control efficiency, weed persistence index and herbicide efficiency index were determined as per Walia (2003). Regression analysis was also carried out between grain yield weed control efficiency at 45 DAS. The data were analyzed following analysis of variance (ANOVA) technique and mean separation were adjusted by the multiple comparison test (Gomez and Gomez 1984).

The most dominant grassy weed species found in the weedy plots were *Echinochloa colona*, *Eleusine indica*, *Panicum maximum*, *Digitaria sanguinalis* and *D. aegyptium*. Among broad-leaf weeds, *Parthenium hysterophorus*, *Mollugo stricta*, *Digera arvensis*, *Phyllanthus niruri* and *Commelina benghalensis* were more rampant.

Result revealed that all the weed management practices significantly reduced the density of weeds over the weedy check. Application of quizalofop-ethyl applied sponsor sample (SS) and market sample (MS) at 50 g/ha were at par with each other and showed its superiority in suppressing the density of weeds, which was lesser than rest of the weed mangement practices (Table 1). Quizalofop-ethyl (MS and SS) at 50 g/ha resulted into significantly less population of grassy weeds over rest of the herbicidal treatments. These results were in conformity with Dixit *et al.* (2012). The application of quizalofop-ethyl at either level of its application did not have any effective control on broad-leaved weeds (BLWs). However, application of imazethapyer at 150 g/ha were found significant in reducing the density of broad-leaved weeds compared to weedy check. Imazethapyr was found less effective

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Table 1. Effect of quizalofop-ethyl on density, biomass and impact indices of groundnut at 45 DAS

Treatment	Dose (g/ha)	Weed density no./m^2		Total weed dry weight (g/m^2)	WCE (%)	Weed persistence index	Herbicide efficiency index
		Grassy weeds	Broad-leaved weeds				
Quizalofop-ethyl	37.5	(2.6) 1.8	(50.8) 7.2	(86.0) 9.3	77.7	0.59	13.5
Quizalofop-ethyl	50.0	(0.0) 1.0	(49.4) 7.1	(54.1) 7.4	86.0	0.39	24.6
Quizalofop-ethyl	37.5	(2.6) 1.8	(49.3) 7.1	(88.7) 9.5	77.1	0.59	15.7
Quizalofop-ethyl	50.0	(0.0) 1.0	(45.3) 6.8	(62.5) 7.9	83.8	0.46	20.0
Imazethapyr	150	(82.7) 9.1	(8.0) 3.0	(197.6) 14.1	48.8	1.05	6.7
Weed free check	-	(0.0) 1.0	(0.0) 1.0	(0.0) 1.0	100.0	0.0	0.0
Weedy check	-	(113) 10.2	(57.5) 7.6	(386) 19.6	0.0	1.0	0.0
LSD (P=0.05)	-	0.9	0.8	1.8	-	-	-

towards the density of grassy weeds due to the higher population of *E. indica* which was not controlled by the application of imazethapyr.

Better response of quizalofop-ethyl in controlling grassy weeds might be due to the fact that aryloxyphen-oxpropionates (AOPP) class to which the herbicide belongs is readily absorbed translocated to meristemaitic region and excert herbicide activity. It acts by inhibiting the enzyme Acetyl Coenzyme carboxylase (ACCase) in susceptible species (Burton 1997). Acetyl coenzyme catalyzes, the first commited step of biosynthesis, is adenosine triphosphate depented carboxylation od acetyl CoA to malonyl CoA. Narrow leaved weeds have a eukaryotic type ACCase in the chloroplast which is sensitive to ACCase inhibitors. Whereas most broad-leaved weed species have a prokaryotic type ASsase which is not sensitive to ACCase inhibitor (Incledon and Hall 1997). Among the tested herbicides, quizalofop-ethyl (MS and SS) at 50 g/ha was found most effective to check all the types of grassy weeds and their growth resulting in lowest biomass in these treatments compared to standard check, imazethapyr 150 g/ha. The efficiency of various treatments with respect to weed control efficiency fluctuated to a greater extent under the influence of various weed control treatments being highest with application of quizalofop-ethyl (SS) at 50 g/ha.

Weed control measures brought about measurable improvement in yield and yield attributes of groundnut over the weedy check. Higher number of pods/plant (no. per plant) and kernel/pod were recorded with application quizalofop-ethyl 5% EC (SS) at 50 g/ha and remained at par with its lower dose applied at 37.5 g/ha. Weed free treatment recorded significantly highest kernel yield in groundnut followed by quizalofop-ethyl 5% EC (SS) at 50 g/ha. The results generated gains support from the other reports (Solanki *et al*. 2005). Among all the herbicide treated plot, the maximum kernel yield of groundnut was obtained with application of quizalofop-ethyl 5% EC (SS) at 50 g/ha which was at par with its market sample applied at same dose and minimum value was associated with weedy plot and post-emergence application of imazethapyr at 150 g/ha. Imazethapyr failed to performed better towards the grain yield because of higher population of *E. indica*. Among all the tested herbicides, lowest weed index (32.7%) was recorded with the application of quizalofop-ethyl 5% EC (SS) at 50 g/ha resulting in 77% increase in kernel yield of groundnut over weedy check.

The effective control of weeds starting from the early crop growth and development stage might have resulted in better kernel yield of groundnut. The variation in kernel yield under different treatments was the results of variation in weed density and weed biomass. Kernel yield and weed control efficiency were positively

Table 2. Effect of quizalofop-ethyl on yield and economics of groundnut

Treatment	Dose g/ha	Pods (no./plant)	Kernel/pod	Kernel yield (t/ha)	Weed index (%)	Net profit (x10^3 `/ha)	B:C ratio
Quizalofop-ethyl	37.5	10.6	1.55	0.88	39.4	11.07	0.33
Quizalofop-ethyl	50.0	10.7	1.53	0.98	32.7	15.55	0.46
Quizalofop-ethyl	37.5	10.4	1.52	0.86	41.3	9.72	0.29
Quizalofop-ethyl	50.0	10.5	1.51	0.92	36.7	12.70	0.38
Imazethapyr	150	9.0	1.47	0.78	46.3	5.48	0.16
Weed free check	-	13.5	1.60	1.46	0.0	36.95	1.03
Weedy check	-	6.4	1.32	0.22	84.9	-21.00	-0.66

SS:sponsor sample, MS :market sample

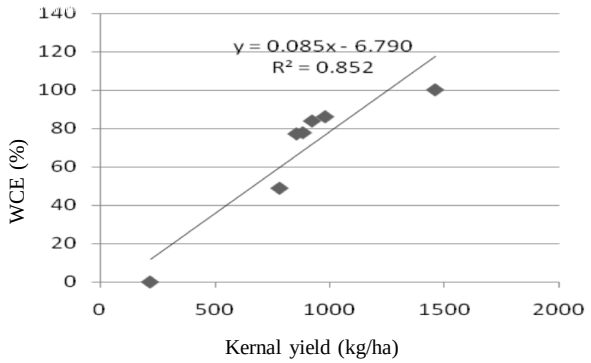

Fig. 1. Relationship between grain yield and weed control efficiency

correlated (Fig. 1). Kernel yield of groundnut increased linearly with increase in weed control efficiency. Grain yield increased from 1000 to 1500 kg/ha as weed control efficiency increased from 60 to 100%. Among the herbicidal treatments, the highest net return and BCR (benefit : cost ratio) were recorded with application of quizalofop-ethyl 5% EC (SS) at 50 g/ha, which was comparable with its market sample applied at 50 g/ha and both of them were higher with rest of the weed control treatments (Table 2) might be due to achieving higher yield. Weedy check had a negative value for the net returns and B:C ratio which depicted groundnut to be unprofitable without effective weed control.

Therefore, application of quizalofop-ethyl 5% EC (sponsor sample) at 50 g/ha proved to be effective and a profitable alternative to the existing recommendation for groundnut under the subtropical region of Uttarakhand.

SUMMARY

A field experiment was conducted at Norman E. Borlaug, Crop Research Center GBPUA&T, Pantnagar to evaluate the efficacy of quizalofop-ethyl market sample (MS) and sponsor sample (SS) in managing grassy weed flora in groundnut. Result revealed that that application of quizalofop-ethyl 5% EC (SS) at 50 g/ha resulted in significantly higher kernel yield (0.98 t/ha) which was at par with its market sample applied at the same dose. Density and dry matter accumulation of weeds was also minimum by the application of these herbicides. However the highest kernel yield was obtained under the weed free situation. Lower weed density, weed dry weight, weed persistence index and weed index in the plots where quizalofop-ethyl (SS) at 50 g/ha was applied. Higher weed control efficiency and herbicidal efficiency index, economic return were recorded under quizalofop-ethyl 5% EC (SS) at 50 g/ha as compared to standard check imazethapyr 150 g/ha. Thus, the post-emergence application of quizalofop-ethyl 5% EC (SS) at 50g/ha seemed to be more beneficial with high productivity and economic return owing to effective weed control.

REFERENCES

Burton JD. 1997. Acetyl-coenyzme A carboxylase inhibitors, pp. 187-205. In: *Herbicide Activity: Toxicology, Biochemistry and Molecular biology* (Eds. Roe, Burton RM and Kuhr RJ), Burke, VA :IOS.

Dixit JP, Singh H and Bhadauria SKS. 2012**.** Quizalofop ethyl: an effective post-emergence herbicide to control grassy weeds of groundnut**.** *Annals of Plant and Soil Research* **14**(1): 22-24.

Etejere EO, Olayinka BU and Wuraola AJ. 2013. Comparative economic efficacy of different weed control methods in groundnut. *European Journal of Biological Sciences* **7**(1):10-18.

Gomez KA and Gomez AA.1984. *Statistical Procedure for Agriculture Research* 2nd Ed, John Wiley and Sons Inc, New York, p. 704.

Icledon BJ and Hall JC. 1997. Acetyl-coenyzme A carboxylase quaternary structure and inhibition by graminicidal herbicide. *Pesticide Biochemistry and Physiology* **574**: 225-271.

Ikisan. 2000. Weed Management in groundnut: http// www.Ikisan.com link/ap cultivation Htm retrieved 12/06/2010.

Khan M, Ashraf M and Siraj-Ud-Din Q. 2004. Chemical control in weeds soybean (*Glycine max*. L.). *Pakistan Weed Science Research* **10**(3-4) 161-168.

Patel SR, Agrawal SK and Chandrakear PK. 1997. Weed management studies in *Rabi*-summer groundnut (*Arachis hypogea*) grown after rice. *Journal of Oilseed Research* **14**: 55-58.

Solanki RM, Bhale VB, Zadav KV and Kelaiya GR. 2005. Studies on integrated weed management in irrigated groundnut. *Indian Journal of Weed Science* **37**(1&2):119-120.

Walia US. 2003. *Weed Management*. Kalyani Publishers, B-I/292, Rajinder Nagar, 396 p.

www.cnagri.com.2012. *World Peanut Production in 2012.*