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EFFICACY OF DIFFERENT HERBICIDES FOR CONTROLLING GRASSY WEEDS IN CHICKPEA (*Cicer arietinum* L.)

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ABSTRACT

To study the efficacy of different herbicides for controlling grassy weeds in chickpea, an experiment was conducted at Agricultural Research Station Ahmad Wala Karak, NWFP, Pakistan during Rabi 2002–03, using RCB design having three replications. The experiment comprised of four herbicides, weedy check and a hand weeding treatment. The herbicides included were Oxadiazone @ 0.36, clodinafop @ 0.03, fenoxaprop-p-ethyl @ 0.75 and propaquizafop @ 0.15 kg a.i ha^{-1} as post-emergence. The data were recorded on weed density m^{-2}, number of branches plant^{-1}, number of pods plant^{-1}, number of grains pod^{-1}, 1000-grains weight (g) and grains yield (kg ha^{-1}). For controlling weeds, hand weeding proved to be the best, giving only 10.67 weeds m^{-2} as compared to 56.85 weeds m^{-2} in weedy check plots. Similarly, maximum grains yield (1367.66 kg ha^{-1}), maximum number of branches (8.26), maximum number of grains pod^{-1} (1.63) and maximum 1000 grains weight (241 g) were recorded in hand weeding plots. In herbicidal treatments, clodinafop produced highest yield (1220 kg ha^{-1}), followed by oxadiazon (1193.33 kg ha^{-1}), propaquizafop (1180 kg ha^{-1}) and fenoxaprop-p-ethyl (1173.33 kg ha^{-1}), respectively. Hand weeding, clodinafop, oxadiazon, propaquizafop and fenoxaprop-p-ethyl produced 60.78, 43.35, 40.39, 38.82 and 38.03 more yield respectively, as compared to weedy check plots. All the herbicides were equally effective against grassy weeds in chickpea with slight differences in their yields.

Key words: Chickpea weed control herbicides.

INTRODUCTION

Chickpea (*Cicer arietinum*) is the principal pulse crop and provides a major source of protein in the diet of the predominantly vegetarian population. It is traditionally cultivated in arid sandy areas of NWFP but recently its production has declined as chickpea has been replaced by the rapid expansion of irrigated areas and the introduction of improved cultivars of wheat. Two main types of chickpea are distinguished, based primarily on seed characteristics: the 'desi' types, having relatively small, angular seeds with rough, usually yellow to dark brown testa; and the 'kabuli' types, which have larger, more rounded and creamed colored seeds (Hawtin and Singh, 1980). The desi types, also known as Bengal grain, constitute about 85% of annual world production and are confined entirely to the Indian Sub-Continent, Ethiopia, Mexico and Iran. The kabuli types comprise only a minor area and production, but account entirely for the crops of Europe and the America, except Mexico. Other, locally important, categories are the 'gulabi' (pea shaped) types of central India and green-seeded desi types of central and northwestern India. In Pakistan during 2001, Chickpea was grown on area of

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905 thousands ha with a production of 397 thousand tonns. Punjab and Sindh are leaders in chickpea production (Anonymous, 2001).

Chickpea yield in our country is low as compared to high potentials of the cultivars. The gap could mainly be attributed to the weed competition in addition to other production constraints. Although chickpeas are traditionally grown on residual soil moisture, weeds competition pose major problem in many situations. Common annual weeds of chickpea include *Chenopodium album, Asphoedelus tenuifolius, Argemone mexicana, Carthamus oxycantha, Cenchrus ciliaris, Fumaria parviflora, Polygonum* sp., *Lathyrus* spp., *Vicia sativa, Euphorbia dracunculoides* and *Orobanche* sp. Common perennial species are *Cyperus rotundus, Cynodon dactylon* and *Cirsium arvense* (Marwat, 1984; Saxena and Yadave, 1976). Hand weeding at 30 and again at 60 days after sowing essentially eliminates the adverse effect of weed competition (Saxena, 1980). In commercial practice, the cultivation of preceeding rainy-season fellows not only helps to capture and conserve moisture but also reduces weed infestations. On black soils, on the wetter areas of central India, "haveli" cultivation (the practice of containing water by bunding in the rainy season) serves similar purposes. Inter-row cultivation by tractor or animal-drawn implements is common, facilitated in North Africa by sowing the crop in very wide rows. Potential yield losses in chickpea due to weeds range between 22-100% (Saxena and Yadave, 1976). Post emergence application of pyradate herbicide gave 97.5% weed control (Skrobakova, 1999). Bhalla *et al.*, (1998) reported that herbicide treatment gave 50-64% weed control with increase in yield. Weed growth was significantly reduced by the use of herbicides and resulted in increase yield of 50% against the control (Stork, 1998). Singh (1998) and Sukhadia *et al.*, (1999) pointed out that weeds reduced productivity in chickpea by upto 36.8% and 41-44%, respectively.

In view of the importance of the weeds problem in chickpea, this experiment was designed to investigate the efficacy of different herbicides on grassy weeds pressure and consequent effects on various parameters of chickpea including yield and yield components.

Materials and Methods

Experiment entitled "efficacy of different herbicides for controlling grassy weeds in Chickpea" was conducted at Ahmad walla Agricultural Research Station Karak, NWFP. The experiment was laid out in randomized complete block (RCB) design with three replications. There were six treatments in each replication. The size of each plot was 3x4 m^2. Each treatment had six rows, 30 cm apart. Cultivar Karak-1 was seeded at the rate of 69 kg ha^{-1} on 3rd October 2002. Standard agronomic practices were followed during the course of the experiment.

The detail of treatments was as under:

Treatments	Common Name	Time of Application	Rate kg a.j ha^{-1}
Topik 15 WP	Clodinafop propargyl	Post-emergence	0.03
Agil 100EC	propaguizafop	Post-emergence	0.15
Ronstar 12L	Oxadiazon	Post-emergence	0.36
Puma Super 75EW	fenoxaprop-p-ethyle	Post-emergence	0.75
Hand Weeding	----------	----------	----------
Weedy check	----------	----------	----------

Data were recorded on weeds density m^{-2}, number of branches $plant^{-1}$, number of pods $plant^{-1}$, number of grains pod^{-1}, 1000 grain weight (g) and grain yield (kg ha^{-1}). All the data were subjected to statistical analysis according to Steel and Torrie, 1980 and the treatment means were separated by LSD test.

Results And Discussion

Statistical analysis of the data showed that weeds density m^{-2} was significantly affected by various weed control measures (Table-1). Maximum weeds m^{-2} (56.85) were recorded in weedy check plots, followed by Puma Super 75EW (32.56 m^{-2}), Ronstar 12L (27.41 m^{-2}) and Agil 100EC (26.44m^{-2}). Minimum weeds were recorded in hand weeding (10.67 m^{-2}) plots. Almost all the four herbicides effectively controlled the grassy weeds of chickpea but the variability in weeds populations in different treatments can be attributed to the fact that the treatments have variable broadleaf weed densities. The results were also in conformity with those reported by De *et al.*, (1995). They reported that all the herbicide treatments and hand weeding were effective against grassy weeds and gave greatest reduction in weeds populations.

Results further revealed that the grassy herbicides and hand weeding had significant effect on the number of branches $plant^{-1}$. Comparison of the treatment means reflects that maximum number of secondary branches $plant^{-1}$ (8.26) were recorded in hand weeding plots, followed by Topik 15WP (8.2), Agil 100EC (8.13), Ronstar 12L (7.33) and Puma Super 75EW (7.2), while minimum number of secondary branches were recorded in weedy check plots. The possible reason for increase in number of branches by hand weeding and herbicides treated plots could be the best control of weeds and consequently maximum utilization of available resources, whereas the least number of branches $plant^{-1}$ in the weedy check could be attributed to the weed competition. These results are in line with the findings of Althahi (1994).

Herbicides and hand weeding had also significant effect on number of pods $plant^{-1}$ (Table-1). Highest number of pods $plant^{-1}$ (44.61) was recorded in plots treated with Topik 15WP. However, it was statistically at par with plots of hand weeding (44.16), Ronster 12L (43.6), Agil 100EC (42.06) and Puma Super 75EW (41.27). Lowest number of pods was recorded in weedy check plots (25.71) due to highest weed infestation. The probable reason for the best performance of herbicides and hand weeding could be the most effective weed control, while the possible reason for minimum pods $plant^{-1}$ in weedy check plots might be due to high competition with weeds. Quite analogous results were reported by Althahi (1994) that weeds reduce pods $plant^{-1}$ in chickpea.

Number of grains pod^{-1} was also significantly affected by different herbicidal treatments and hand weeding. The highest (1.63) number of grains pod^{-1} was obtained from hand weeding plots which was statistically at par with Topik 15WP (1.466) and Ronster 12L (1.36). The lowest number of grains pod^{-1} was recorded in weedy check plots (1.12). The number of grains pod^{-1} produced by Agil 100EC, Ronster 12L and Puma Super 75EW were non significantly different from weedy check plots which may be attributed to highest population of broadleaf weeds in these plots which were not actually controlled. The possible fact for highest number of grains pod^{-1} in hand weeding and Topik 15WP plots was due to effective control of weeds.

Statistical analysis further enunciated that herbicides and hand weeding had significant effect on the mean values of 1000 grains weight (Table-1). Highest 1000 grains weight (241 g) was noted in hand weeding plots, followed by Topik 15WP (220 g). Ronstar 12L (209 g), Agil 100EC (206 g) and Puma Super 75EW (189 g). The lowest

1000 grains weight was recorded in weedy check plots (140 g). The probable reason for highest 1000 grains weight in hand weeding plots was largely due to the fact that it showed maximum weeds control, thus maximized the available resources for the crop and reduced weeds competition, while the probable fact for lowest 1000 grains weight might be due to weeds competition. These results are in line with the findings of Hosseini (1997).

In case of grain yield kg ha^{-1}, analysis of variance revealed that herbicides and hand weeding had significant effect on yield. Data indicated that maximum grain yield of (1367.67 kg ha^{-1}) was obtained from hand weeding plots. However, it was statistically at par with all the herbicides i.e. Topik 15WP (1220 kg ha^{-1}), Ronstar 12L (1193.33 kg ha^{-1}), Agil 100EC (1180kg ha^{-1}) and Puma Super 75EW (1173.33 kg ha^{-1}). The minimum grain yield was recorded in weedy check plots (850 kg ha^{-1}). The highest yield in hand weeding plots and herbicides was probably due to effective weed control and thus the crop was flourished and efficiently utilized the available resources. Almost all the four herbicides equally controlled all the grassy weeds in chickpea. The slight differences in their grain yield might be due to the fact that different treatments were also facing competition with different broadleaf weeds. Singh (1998), Bhalla *et al.*, (1998) and Balyan and Malik (1996) also reported analogous results.

Table-1. Efficacy different grassy herbicides on weed density m^{-2}, number of branches plnat^{-1}, number of grains pod^{-1}, 1000 grains weight (g) and grain yield (kg ha^{-1}) of Chickpea

Treatments	Weeds Density m^{-2}	Number of Branches plant^{-1}	Number of Pods plant^{-1}	1000 grains weight (g)	Grain Yield (kg ha^{-1}
Topik 15 WP	23.49 b	8.20 a	44.61 a	1.47 ab	1220.00 b
Agil 100EC	29.44 b	8.13 a	42.06 a	1.17 bc	1180.00 b
Ronstar 12L	27.41 b	7.33 a	43.60 a	1.36 abc	1193.33 b
Puma Super 75EW	32.56 b	7.20 a	41.27 a	1.30 bc	1173.33 b
Hand Weeding	10.67 c	8.26 a	44.16 a	1.63 a	1367.66 a
Weedy Check	56.85 a	4.33 b	25.71 b	1.12 c	850.00 c
$LSD_{0.05}$	10.30	2.587	10.33	0.29	70.90

Means followed by different letters were significantly different at 5% level of probability.

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