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Management of Corn Weeds by Broomcorn Sorgaab and Foramsulfuron Reduced Doses Integration

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Abstract. Broomcorn (*Sorghum vulgare* var. *technicum*) sorgaab (water extract of mature sorghum plants) integration with furamsulfurun (FS) 50, 25 and 12.5 % of recommended dose along with 100% FS and handweeding and pure sorgaab effects on weeds in corn filed in Mianeh region, Iran were investigated as randomized complete blocks design in 2010 growing season. The results showed the less effect of sorgaab but the more chlorophyll production in corn appyig sorgabb but the same seed and biological yield and shorted and bigger kernals comparing FS in recommended dose. Sorgaab is going to b recommendable in corn fields considering the results.

Keywords: allelochemicals, allelopathy, integrated managment, *Sorghum vulagre* ver. *technicum*

1. Introduction

Corn (*Zea mays* L.) is sensitive to weeds especially in early growth stages production (Cheema *et al.,* 2004; Baghestani *et al.,* 2007). Indiscriminate use of chemicals for controlling weeds may pose environmental problems (Cheema & Khaliq, 2000). Although herbicides are very effective in controlling weeds yet certain risks as environmental pollution and human health are involved in herbicide use. Use of herbicides requires technical know how which is generally lacking in the country (Cheema *et al.,* 2005) and there are increasingly reports on herbicide resistance (Nurse *et al.,* 2006). Therefore, it is necessary to consider biological safe products like sorgaab. Sorgaab is a natural herbicide as water extract of mature Sorghum obtained after soaking in water for 24 h and sprayed on weeds (Cheema *et al.,* 2003, 2001b). Several studies have revealed remarkable efficiency of sorgabb in weed management and sorgaab can inhibit weeds ranged between 40-50% comparing with weedy control but less than weed control achieved with herbicides (80-100%) (Cheema *et al*., 2000-2006; Iqbal & Cheema, 2008). The integrated methods will be another way. Cheema & Khaliq (2000) reported up to 35–49% of weeds inhibition and increasing in wheat yield by 10–21%. when sprayed by sorgaab. A combination of sorgaab with reduced rates of Pendimethalin for weed control in cotton, gained maximum reduction (85.2%) in total weed dry weight by Sorgaab 12 L ha^{-1} + 2/3 Pendimethalin at 45 days after sawing (Cheema *et al*., 2005). Ethoxysulfuron and butachlor at reduced rates were integrated by sorgaab and showed sorgaab 12 L ha^{-1} with reduced doses 1/3-1/2 of ethoxysulfuron and butachlor, showed maximum reduction in total weed dry weight (about 77%). Weeds of raya were controlled up to 45% by sorgaab spraying (Bhatti, 2000). Sorgaab reported as a natural weed inhibitor (about 44%) in spring mungbean (Cheema *et al*., 2001). Purple nutsedge management in cotton was performed with combined application of sorgaab and s-metolachlor (Iqbal & Cheema, 2008). Sorgaab foliar spraying controlled from 18-50% weeds and increased maize grain yield by 11-44%. Mature sorghum herbage (10-15 Mg ha^{-1}) surface applied at sowing controlled up to 26-37% weeds and increased maize yield

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by 36-40%. The current experiment was carried out to evaluate possible corn weed management by sorgaab and foramsulfurom reduced dose integration.

2. Material and Methods

The experiment was carried out in Islamic Azad University, Miyaneh Branch's Research Farm located in 5 km of Miyaneh, Iran in 2010 growing season. It was conducted based on randomized complete blocks design with three replications. Treatments were sorgaab (2 kg/Li), sorghab + 50, 25, and 12.5% of recommended foramsulfuron, recommended rate (100%) of foramsufurun and hand weeding. The planted corn cultivar was SC704 which was planed in five lines with 5 m length and 60 and 25 cm intra and inter rows distance. Each plot (3 × 10 m) was divided by rope from the middle and treatments were applied in upper part. The downer part was considered as control. Sorgaab was prepared by broomcorn (*Sorghum vulgare* var. *technicum*) mature stems cut into 2-cm pieces and soaked for 48 hours in tap water. The solution was filtered and applied when corn was in 4-leave stage. The weeds were sampled 15, 30, and 45 days after sawing by 1 × 1 m wooden quadrate and the number and dry weight (70 ˚C for 48 hours) of weeds were recorded. The reduced percentage of number and dry weight of weeds were calculated. The chlorophyll content was determined by SPAD in flowering stage. The crop traits such as number of seeds per raw, head length and diameter, thousand kernel weight, seed and biological yield, harvest index and seed numbers per ear were recorded using by middle lines from 10 plants.

3. Results and discussion

3.1. Weed species

ANOVA of weed species traits showed there was significant difference between treatments regarding effect on velletleaf, fat hen, filed bindweed, and redroot pigweed numbers ($p < 0.05$) and total number ($p < 0.05$) and dry weight ($p < 0.01$) of all species (table 1).

Table 1: Variance analysis of weed species affected by sorgaab and furamsulfuron integration

Source of variation	df	Mean of Square					
		Velvetleaf	Fat hen	Filed bindweed	Redroot pigweed	Total weeds no.	Weeds dry weight
R (block)	2	2.057^{ns}	20.48^{ns}	1005.6^{ns}	494.697^{ns}	164.1^{ns}	12.423^{ns}
Treatments	5	7.08^{*}	875.62^{*}	1222.8^{*}	2629.75^{*}	553.912^{*}	602.09^{**}
Error	10	1.945	246.15	352.449	728.637	143.287	102.192
C.V. (%)	-	9.65	12.14	14.10	9.21	13.14	9.32

Also, sorgaab had significant effect on velvetleaf inhibition (58.84%) rather than furamsulfuron recommended dose (20.81%). The same effect was observed adding different dose of furamsulfuron comparing pure sorgaab on velvetleaf. Fat hen was more sensitive to furamsulfurun than sorgaab. There was no significant difference between all integrated sorgaab and herbicide doses on fat hen. Sorgaab had better effect on filed bindweed too, comparing framsulfuron recommended dose. Also on pigweed sorgabab was less effective (30.25%) than furamsulfuron (64.36%). On the whole, sorgaab was less inhibitive on weeds (33.25%) than herbicide (56.58%). Adding higher dose of furamsulfuron increased inhibitive effect. The same results were found in dry matter of total weed species (table 2).

3.2. Crop yield and yield components

ANOVA of corn traits showed there was significant difference between treatments in plant height, stem diameter, ear length ($p < 0.05$), see number per raw in ear, see number per ear, thousand kernel weight, seed yield, biological yield and chlorophyll content ($p < 0.01$) (table 3). There were no significant differences between treatments in number of rows per war and harvest index.

Table 2: Mean's comparison of weed species affected by sorgaab and furamsulfuron integration

Source of variation*	Velvetleaf	Fat hen	Filed bindweed	Redroot pigweed	Total weeds no.	Weeds dry weight
FS	20.81^{c}	73.34^{a}	36.65^{b}	64.38^{a}	56.58^{ab}	64.12^{a}
FS_{50}+S	28.59^{bc}	65.33^{ab}	38.66^{b}	64.24^{a}	57.50^{ab}	57.33^{ab}
FS_{25}+S	40.86^{abc}	42.67^{b}	49.53^{ab}	37.56^{b}	50.24^{abc}	54.00^{b}
$FS_{12.5}$+S	52.86^{ab}	64.33^{ab}	39.17^{b}	35.65^{b}	46.35^{bc}	47.25^{bc}
S	58.84^{ab}	41.44^{b}	57.67^{a}	30.25^{b}	33.25^{c}	31.82^{c}
HW	63.39^{a}	72.97^{a}	60.38^{a}	70.25^{a}	64.06^{a}	66.49^{a}

* FS = furamsulfuron, S = sorgaab, HW = hand weeding

** All data are as reduced percentage comparing control

The plants were stunted applying sorgaab. The shorter plants produced when only sorgaab was applied. The FS_{50}, FS_{25}, and $FS_{12.5}$ + S treatments had the same effect on plat high in corn. The same result was obtained with stemm diameter, showing the weeds better controlling by furamsulfuron resulted in producing stronger plants. There was no significant difference between FS and $FS_{12.5}$ + S treatment, indicating we can decreased dose up to 75% integrating sorgaab to reach the same effect on pant height and stem diameter (table 4).

Table 3: Variance analysis of corn traits affected by sorgaab and furamsulfuron integration

Source of variation	df	Mean of Square								
		Plant height	Stem diameter	Ear length	Seed no. per row	Seed no. per ear	1000 kernal weight	Seed yield	Biological yield	Chlorophyll content
R (block)	2	0.317^{ns}	0.097^{ns}	1.207^{ns}	3.680^{ns}	32553^{ns}	2570.389^{**}	2.460^{ns}	10.790^{ns}	1.800^{ns}
Treatments	6	0.676^{*}	0.456^{*}	1.566^{*}	44.820^{**}	13944.9^{**}	2489.025^{**}	43.600^{**}	51.930^{**}	39.174^{**}
Error	12	0.221	0.131	1.241	3.641	7897.1	269.056	2.421	10.751	2.142
C.V. (%)	-	9.35	12.18	9.48	8.14	11.41	10.92	9.28	13.05	12.6

Applying sorgaab only resulted in significantly shooter ear production with bigger kernals, considering thousand kernel weight. However the seed yield was the same applying furamsulfuron in recommended dose comparing sorgaab. Also the same biomass produced in these treatments. Chlorophyll content increased apling sorgaab. Sorgabb resulted in the more fresh and green plants. It may compensate the week effect of sorgaab on weeds comparing FS then resulted about the same effect on crop yield in corn (table 4).

Regarding the result of this stud, sorgaab is recommendable as biological herbicides in corn filed. Its application and producing manner should be taught to farmers, considering the abundance of broomcorn cultivation in Miyaneh region.

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Table 4: Mean's comparison of corn traits affected by sorgaab and furamsulfuron integration

Traits / Treatments	Plant height (cm)	Stem weight (cm)	Ear length (cm)	Seed no. per row	Seed no. per ear	1000 kernal weight	Seed yield (kg/ha)	Biological yield (kg/ha)	Chlorophyll content
FS	231.67^{a}	1.94^{b}	20.01^{a}	33.67^{a}	428.65^{a}	195.67^{d}	7579.63^{a}	36300^{ab}	26.56^{e}
FS_{50} +S	225.33^{ab}	2.10^{ab}	18.00^{ab}	34.33^{a}	420.65^{a}	225.36^{a}	7457.36^{ab}	35689^{abc}	28.08^{d}
FS_{25} +S	226.67^{ab}	2.10^{ab}	16.33^{abc}	25.33^{b}	360.00^{b}	215.00^{b}	6898.67^{c}	34000^{c}	30.08^{c}
$FS_{12.5}$ +S	227.00^{ab}	2.07^{ab}	20.33^{a}	30.33^{ab}	411.67^{ab}	206.67^{c}	7263.55^{b}	36100^{ab}	32.45^{b}
S	214.33^{b}	2.23^{a}	14.33^{c}	27.00^{b}	310.33^{c}	23.33^{a}	6744.00^{a}	33000^{d}	35.37^{a}
HW	231.99^{a}	1.92^{b}	20.67^{a}	34.33^{a}	431.33^{a}	181.67^{e}	7603.67^{a}	37001^{a}	35.30^{a}
C	200.65^{c}	2.20^{a}	9.50^{d}	19.02^{c}	250.36^{d}	232. 99^{a}	6423.23^{e}	30000^{e}	34.71^{ab}