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Efficacy of Sorgaab as Natural Weed Inhibitor in Raya

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Abstract: Sorgaab (water extract of mature *Sorghum bicolor* plants) was evaluated for its effect on weeds in Raya crop and it was compared with commonly employed weed control practices i.e hand weeding and a herbicide-pendimethalin in a field trial during 1998. Results revealed that Spraying of sorgaab at 15, 30 and 45 Days After Sowing (DAS) reduced dry weight of all weeds by 45-85% while herbicidal treatment reduced dry weight by 45%. The yield of Raya crop was significantly enhanced (33-58 96) with sorgaab over control. Hand weedings (one and two) at 15 + 30 DAS increased Raya seed yield by 40-72% while herbicidal treatment improved the seed yield by 26% and was uneconomical due to higher cost as compared with one, two and three sprays of sorgaab.

Key words: Allelopathy; Weed control; Pendimethalin; Raya

Introduction

Use of allelopathic crop residues in the form of surface mulches and water extracts as foliar sprays has shown promising results in modern weed management systems (Putnam *et al*., 1983; Cheema, 1988). Foliar spray application of sorgaab (1-2 sprays) suppressed weed growth by 25-48 96 and increased wheat yield by 13-18% reported by Luqman (1997) and Iqbal (1997). In an other study Ahmad (1999) reported 34% reduction in weed biomass with three foliar sprays of sorgaab and 37 96 increase in maize yield. Similarly Khaliq *et al.* (1999) recorded 9 96 increase in soybean yield with two sprays of sorgaab however they indicated that its application at 65 DAS affected soybean yield.

The usual weed control methods (as hand weeding and chemical weedicides in Raya are either expensive or hazardous. The successful use of sorgaab in wheat and other crops as maize, soybean and mungbean for inhibiting weed growth and improving crop yields provided the idea to test it in Raya which is an important winter oil seed crop of the region.

Materials and Methods

A field trial was conducted to study the allelopathic effects of sorgaab (sorghum water extract) on weeds and Raya Anmot (*Brassica juncea* L.) at Agronomic Research Area, University of Agriculture, Faisalabad during 1998-99. Sorgaab was prepared by soaking mature dried and chaffed sorghum (*Sorghum bicolor* L.) herbage in water (1:10 wiv) for 24 hours and then filtered to collect the extract. The extract was either used fresh or stored in deep freezer for subsequent use. Experiment was quadruplicated in a Randomized Complete Block Design (RCDD) using a net plot *size* of 5 × 2.5 m. The crop was sown in october 1998 using a seed rate of 5 kg ha^{-1} with single row hand drill in 60.0 cm apart rows. Thinning was done at four leaf stage to maintain plant to plant distance of 15 cm. A basal dose of phosphorus (triple super phosphate) at 75 kg ha^{-1} was applied at sowing time while Nitrogen (Urea) at 75 kg ha^{-1} was used in two splits i.e 112 at sowing and 1/2 at first irrigation. Calibration was performed to determine the volume of spray. Pendimethalin was applied as pre emergence and sorgaab was sprayed on the standing crop and weeds with the help of knap sack hand sprayer fitted with flat fan nozzle according to the following treatments. Control, Sorgaab 15 days after sowing (DAS), Sorgaab (two sprays' 16 + 30 DAS, Sorgeab 30 + 45 DAS, Sorgeab (three sprays) 15 + 30 t 45 DAS, Hand weeding (one) 15 DAS, Hand weeding (two) 15 + 30 DAS, Pendimethalin Pre Emg at 1.5 kg a.i ha^{-1}.

Data on weed density and biomass were recorded thrice at 20, 35 and 50 days after sowing (DAS) from randomly selected two quadrates from each experimental plot. Weeds were cut from ground surface counted individually and then weighed after drying in an oven at 80°C for 48 hours. Data on various crop growth parameters were recorded from randomly selected samples, Stalk and grain yield was recorded, on plot basis then converted into kg ha^{-1}. Data collected were subjected to Fisher's analysis of variance technique and treatment means were compared using least significance difference (LSD) test at 0.05 probability level (Steel and Torrie, 1980). Economic analysis of the treatments was performed to determine the economical treatment (Byerlee, 1988).

Results and Discussion

Following weeds were noticed at the experimental site viz. Wild spinach (*Rumex dentatus* L), Jangli haloon (*Coronopus didymus*), (L) Smith, Green foxtail (*Setaria viridis*, (L) Beauv, and Purple nutsedge (*Cyperus rotundus* L).

Maximum suppression (78%) in total weed density was observed in case of two hand weedings and was followed by three sorgaab sprays which reduced weed density by 83% (Table 1). In case of individual weed species maximum suppression in densiy of *Rumex dentatus and Coronopus didymus* was noticed under two hand weedings by 91 and 89% respectively, and was followed by three sorgaab sprays (16 + 30 + 45 DAS) reducing their density by 73 and 53% respectively while herbicidal treatment reduced thedensity of *Rumex dentatus* by 44% Maximum suppression in density of *Setaria viridis* and *Cyperus rotundus* was observed in case of three sorgaab sprays and while two hand weedings decreased density of these weeds by 25 and 37% respectively. Herbicidal treatment decreased density of these weeds by 13 and 7% respectively. These results indicate selective suppressive effects of sorgaab on the total weed population which support the work of Cheema (1988).

Dry weight of *Rumex dentatus*, *Coronopus didymus*, *Setaria viridis* and *Cyperus rotundus* was reduced significantly in most of the treatments but some treatments showed non-significant effect (Table 2).

Maximum suppression in total dry weight was observed in case of two hand weedings and was followed by three, sorgaab sprays decreasing dry weight by 76.96. Herbicidal treatment reduced dry weight by 45%.

Maximum suppression in dry weight of *Rumex dentatus* was noticed in case of two hand weedings followed by herbicidal treatments, decreasing dry weight by 81% while three

Table 1: Allelopathic effects of sorgaab on density of weeds at 50 DAS 10.50 m^{-2})

Treatments	Density of Purple nutsedge	Density of wild spinach	Density of Coronopus didymus	Density of Green foxtail	Total weed Density	Percent decrease over control
Control	3.375a	19.625a	14.750a	5.500a	45.25a	(--)
One sorgaab spray at 15 DAS	2.000bc	11.750c	9.125h	4.625abc	27.38be	39
Two sorgaab sprays at 15 + 30 DAS	0.750d	7.750de	8.000b	3.75cd	20.88cd	53
Three sorgaab sprays at15 + 30 + 45 DAS	0.500d	5.125e	6.887b	3.263d	16.88be	62
Two sorgaab sprays at 30 + 45 DAS	1.625cd	15,250b	9.375b	5.00ab	30.50b	32
One hand weeding 15 DAS	2.750ab	9.125cd	9.875b	4.50abc	26.63be	41
Two hand weedings 15 + 30 DAS	2.215be	1.750f	1.50c	4.125bed	9.87e	78
Stomp at 1.5 kg ai/he	3.125ab	10.875cd	14.875a	4.750abc	32.63b	27
$LSD_{(0.05)}$	1.236	3.363	3.075	1.039	7.504	

Any two means not sharing a letter in common differ significantly according to LSD at 5% probability level

Table 2: Allelopathic effects of soraab on dry weight of weeds at 50 DAS 10.50 m^{-2})

Treatments	Dry weight of Puruple nutsedge	Dry weight of wild spinach	Dry Weight of Jangli haloon	Dry Weight of Green foxtail	Total Weed dry weight
Control	0.6300a	2.895a	3.909a	3.382a	11.120a
One sorgaab spray at 15 DAS	0.3275bcd (48)	1.966be (32)	1.619b (58)	1.899b (43)	5.B11b (47)
Two sorgaab sprays at 15 + 30 DAS	0.1125cd (82)	1.676be (42)	1.324b (66)	0.626c (81)	4.254 c (61)
Three sorgaab sprays at 15 + 30 + 45 DAS	0.0400d (93)	1.434c (50)	0.694c (82)	0.486c (86)	2.737d (75)
Two sorgaab sprays at 30 + 45 DAS	0.1625bed (74)	2.065b (28)	1.701b (56)	1.576b (53)	5.3913b (51)
One hand weeding 15 DAS	0,5525ab (12)	1.718be (40)	1.514h (53)	1.640b (51)	5.858b (45)
Two hand weedings 15 + 30 DAS	0,4980abc (20)	0.218ci (90)	0.086d (97)	0.831c (75)	1.635a (85)
Stomp @1.50 kg a.i/he	0.5630a (10)	0.540d (81)	3.490a (10)	0.890c (73)	6.014h (45)
LSD	0.3946	0.5522	0.6063	0.4508	1.093

Table 3: Allelapethic effects of sor ash on Rays Anmol

Treatments	Plant height (cm)	No. of pods plant	1000-seeds weihht (g)	Seeds yield (kg/ha)	Percent increase over control
Control	121.90d	304.50d	2.220d	538.00d	(---)
One sorgaab spray at 15 DAS	131.95c	442.65be	2.512be	738.00be	37
Two sorgaab sprays at 15 + 30 DAS	145.65b	520.90ab	2.728eh	758.00 bc	41
Three sorgaab sprays at 15 + 30 + 45DAS	146.05b	552.40ab	2.752a	848.00ab	58
Two sorgaab sprays at 30 + 45 DAS	128.5c	441.55bc	2.488a	716.00be	33
One hand weeding 15 DAS	141.05b	465.70abc	2.550be	756.00be	40
Two hand weedings 15 + 30 DAS	154.75a	567.10a	2.795a	928.00a	72
Stomp at 1.5 kg a.i/he	128.25c	361.50cd	2.462c	680.00cd	26
$LSD_{(0.05)}$	6.326	113.8	0.2278	161.6	

Any two means not sharing a letter in common differ significantly according to LSD at 5% probability level

sorgaab sprays reduced it by 50%.

The dry weight of *Coronopus didyinus* in case of two hand weedings by 97% followed by sorgaab three sprays decreasing dry weight by 82%. Herbicidal treatment lstomPl decreased dry weight of this weed by 10 96.

Dry weight of *Setaria viridis* was inhibited upto 85% with three sorgaab sprays. Two hand weedings decreased dry weight by 75% and was followed by herbicidal treatment decreasing dry weight by 73%. These results are in conformity with the findings of Filho *et al*. (1997) who stated that sorghum allelochemicals reduced the growth of *Sataria viridis.*

Maximum reduction in dry weight of *Cyperus rotundus was* observed in case of three sorgaab sprays and was followed by two sprays decreasing dry weight by 82%. Two hand weedings decreased dry weight by 20% Herbicidal treatment, Herbicidal treatment (Stomp) showed non-significant effect. The inhibition in the growth of *Cyperus rotundus* was due to the presence of allelochemicals present in sorghum water extract These results are in line with the findings of Cheema (1988), Kalair (1989) and Ahmad (1998) who reported inhibitory behavior of sorghum water extract against growth of *Cyperus rotundus.*

Weed control practices exhibited differential effects an plant height (Table 3). Tallest plants 155.75 cm were observed where two hand weedings were done, followed by three sorgaab sprays which was statistically on par with two sprays and one hand weeding at Herbicidal treatment (Stomp) had less effect on plant height than other treatments. The enhanced plant height was more in those plots where weed control was more. The effect of better weed control on plant height is supported by Ahmad (1998) who stated that plant

height was increased due to better weed control.

Most of the treatments significantly influenced the number of pods per plant (Table 3). Maximum number of pods per plant was recorded in case of two hand weedings. Three sorgaab sprays was the next treatment with higher pods, however, it was statistically on par with two sorgaab sprays, one hand weeding, two sorgaab sprays and one sorgaab spray. Herbicidal treatment had no effect on number of pods probably due to less weed control.

All the treatments significantly enhanced 1000-seed weight as compared to control. Maximum 1000-seed weight was recorded where two hand weedings at 15 + 30 DAS were given and it was statistically on par with three sorgaab sprays and two sorgaab sprays. Herbicidal treatment IStomp) was least effective among the treatments possibly due to less weed control, however, it was statistically on par with one hand weeding at 15 DAS, two sorgaab sprays at 30 + 45 DAS and one hand weeding at 15 DAS. The effect of sorgaab on seed weight was possibly due to its inhibitory allelopathic effects on weeds growth. These results confirm the findings of Cheema (1988) who reported that 1000-seed weight of wheat was increased due to suppression of weeds in plots where sorgaab was applied.

Most of the treatments significantly influenced the seed yield. Maximum seed yield was recorded in case of two hand weedings. Three sorgaab sprays was the next treatment with higher seed yield, However, it was statistioally on per with two = Neat) sprays, one hand weeding, two sorgaab sprays and one sorgaab spray. Pre-emergence application of Stomp at 1.5 kg ai ha^{-1} had non-significant effect on seed yield.

Enhanced seed yield with sorgaab foliar spray was mainly due to better weed control at early crop growth stages indicating the presence of allelochernicals in sorghum. Hand weeding showed its superiority over the treatments in improving yield possibly due to better weed control. The effect of better weed control on seed yield is supported by Iqbal (1997) who reported that yield of wheat was increased in plots where sorgaab was applied.

On the basis of this study it may be suggested that sorgaab could be used as natural weed inhibitor for enhancing Rays seed yield.

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