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The Effect of *Sorghum Bicolor* Extracts and Lower Rate of Trifluralin Herbicide on Weeds in *Vigna Sinensis* L.

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Abstract. Allelopathic influence of *Sorghum bicolor* cultivar (Cv Enqatht) on the growth and development of a few weeds test (*Beta vulgaris* L., *Chenopodium album* L., *Amaranthus retroflexus* L., and *Malva rotundifolia* L.) and weeds company with *Vigna Sinensis* L. crop were investigated. All treatments significantly (0.05) reduced total weed density by (32.4) and total dry biomes by 57.1) gm above control at a rate of 4 gm kg⁻¹ soil results pots experiment. However, when the 8gm.kg⁻¹ of soil was put to pots altered with *Sorghum bicolor* residual residue, the decrease was much greater. The second experiment was done using a R.C.B.D design to investigate the effects of *Sorghum bicolor* decarase (rate 800 g. meter⁻²) on the development of *Vigna Sinensis* L. crop and companion weeds, compared to a control treatment and a full rate of Trifluraln herbicide (50 percent) (2.4 L.h⁻¹). The field experiment result showed a trend of *Sorghum bicolor* residue at 800 gm/ kgm effect on number of company weed of *Vigna Sinensis* L., crops by (38, 4.7, 24, 10.67, 38.7) and biomass (68, 63.7, 61.7, 22.33, 27.3) gm compared to control treatment, however, this reduction was further increased when the 50 percent full rate of herbicide was applied to plots amended with *Sorghum bicolor* residues. In comparison to the control treatment, the application of *Sorghum bicolor* residues in conjunction with a 50 percent rate of trifluralin boosted biological yield and harvest index of *Vigna Sinensis* L. crops. Conclusion: *Sorghum bicolor* residue might be employed as a realistic and ecologically sound weed management and soil enhancement strategy for *Vigna Sinensis* growing crops.

Keywords. *Sorghum bicolor*, Trifluralin herbicide, *Vigna Sinensis* L.

1. Introduction

Crop yields are projected to be reduced by 45 to 95 percent as a result of uncontrolled weed development, depending on crop and plant species, weed density, and ecological conditions [1,2]. In most agricultural systems, around 3 million tons of herbicides are used each year [3]. Herbicides may create pollution, human health problems, weed resistance, soil depletion, and crop yield decline [4-6]. Allelopathy is used in weed-crop, crop-weed, crop-crop, forestry, and nutrient cycling [7-9] to minimize reliance on chemical herbicides for weed control [10,11]. Weeds in field crops may be controlled with sorghum water extracts and low-dose herbicides [12-14].

In addition, the procedure was both time-consuming and cost-effective. Because of these constraints, an alternative practical and practicable approach has been developed, in which allelopathic crops, such as sorghum, are left excessively dry under field conditions and then quickly introduced into production sites for weed management [15,16]. Using this approach, it was discovered that using sunflower or



sorghum decrease in combination with a lower rate of herbicides resulted in weed control and crop yields comparable to the label rate of the herbicides studied [17-20]. Following sorghum in the agricultural cycle, cowpea is an important legume crop. Various weed species affect the productivity of cowpea fields, reducing it by up to 30%. [21,22]. Nonetheless, one of the major problems limiting its development is weed infestation. When compared to weed-free settings, uncontrolled weeds may reduce cowpea output by 50-90 percent [23]. Weeds are often controlled with a pre-emergence application of trifluralin herbicide [24]. There hasn't been any research on the impact of combining both sorghum residues and a reduced herbicide rate for weed control in cowpea. The purpose of the preliminary study was to determine the feasibility of employing allelopathic sorghum residues in conjunction with a lowered (50 percent of label rate) trifluralin rate for weed control in cowpea, with the goal of achieving cost-effective and safe weed control.

2. Materials and Methods

2.1. Sitedescription

The suggested proposal was sent to the Wasit Province, Iraq, Research Station of the State Board of Agricultural Extension, Ministry of Agriculture. The topsoil at the exploration location was calcareous earth. Natural carbon, pH, and EC, respectively, were 0.8 percent, 7.7, and 7.4 dS m⁻¹. During the developing season, the average annual precipitation was less than 50 mm, and day/night temperatures were 30-40/15-30 °C.

2.2. Seeds and Herbicide Purchases

Sorghum cv. seeds Cowpea cv. and enqatht Biader were received from Bagdad University's Department of Crop Production, College of Agriculture. Trifluralin 48 percent EC, a Shanghai Bosman Industrial Company product, was bought on the black market.

Sorghum residues bioassay in combination with a lower trifluralin rate. Each plot is 22.5 meters long. N2 as urea (46 percent N) at 80 kg ha⁻¹ and triple phosphate (46 percent P2O5) at 240 kg ha⁻¹ were utilized as fertilizers. All of the phosphorus and half of the nitrogen were applied with irrigation at the time of planting, and the remaining nitrogen was applied four weeks later. Seeds of cowpea were manually seeded in all plots in 40 cm spaced harvest lines with a 20 cm plant to plant separation in mid-August. Throughout the trial, all plots received prescribed water system water. Sorghum deposit rates (800gm/m⁻¹) with and without half rate of trifluralin were used as medicines (1.2 L ha⁻¹). In addition, a weed-free version was included for testing. The experiment included three replications and was set up in a randomized finish square layout. Trifluralin was used as a soil conditioner before to planting. Water was used to regulate the shower volume (300 L ha⁻¹). At a pressure of 207 k Pa, Trifluralin was attached using a Knapsack hand sprayer with a T-Jet spout. Weed thickness and biomass were measured 60 days after sowing (DAS) in four randomly chosen quadrates (5050 cm) of each sub plot, and the middle value was calculated. Weed dry weight was measured after 72 hours of drying in a stove at 75°C. Cowpea plants were harvested at various stages of physiological development. Ten plants were picked at random from each cowpea patch. Following the normal method, dry weight biomass, number of cases per plant, number of seeds per case, number, weight of 500-seeds, and seeds yield/m² were measured at 70°C for 48 hours. With four replications, the study was set out in a randomized finish square design (RCBD). Fisher's investigation of fluctuation system was used to examine the information received. To examine treatment implications, a 0.05likelihood level Slightest importance distinction (LSD) test was used [25]

2.3. Sorghum Residues Bioassay Against Weed Test

The purpose of this study was to examine whether the test sorghum cultivars could differentiate between weed seeds of *Beta vulgaris* L., *Chenopodium album* L., *Amaranthus retroflexus* L., and *Malva rotundifolia* L. The soil was extracted, thoroughly mixed, air-dried in the shade, and strained through a 2-mm strainer. To guide the drugs, the soil was separated into six 1-kilogram portions. The medications were soil amended with 4 and 8 g of sorghum deposits per kilogram of soil alone. To maintain the natural problem the same, control treatments were created by combining 3 and 6 g of peat

greens with soil [26]. Soil was carefully mixed and placed into 250 g plastic pots. Weed seeds ((*Beta vulgaris* L., *Chenopodium album* L., *Amaranthus retroflexus* L., and *Malva rotundifolia* L.)) were seeded in different pots. In a plastic home, the pots were put in randomized entire blocks in three replications and watered with the proper quantity of water as required. Seed germination was measured 10 days after planting, following which the seedlings were reduced to four per pot and allowed to grow for a further three weeks. Using flowing water, the plants were removed from their containers. The weed number was determined by adding together the dry weight. The plants were dried in a broiler for three days at 70 degrees Celsius and then weighed using an electric scale.

3. Results

Experiment with bioassay Test sorghum residues have an allelopathic impact on weed test. The results showed that all treatment of sorghum residues had a significant inhibitory effect on germination, fresh and dry weight of weeds test (*Beta vulgaris* L., *Chenopodium album* L., *Amaranthus retroflexus* L., and *Malva rotundifolia* L.) as compared to weedy control (Table 1). Incorporation of sorghum residues in soil at 4gm/ kg soil and 8gm/ kg soil substantially reduced weed seedling emergence compared to the weedy control treatment. During most of the decomposition periods, however, spraying of sorghum residue at 8 gm/kg⁻¹ inhibited weed seedling emergence by (46.3, 40.3, 26, 27) when compared to the weedy control.

The incorporation of sorghum residues at 4 and 8 gm/kg⁻¹ soil significantly inhibited dry weight biomass, and the inhibition began soon after decomposition and continued throughout all decomposition periods as referred to in (Table 1), implying that the increase in dry weight mass was related to the increased residue weight. According to this, the application of residues at 8 gm/kg⁻¹ soil showed more inhibition to dry weight biomass than sorghum residue at 4 gm/kg⁻¹ soil. When compared to weedy check, dry weight biomass was (81.3, 89.3, 106, 68) gm /m⁻² at 4 gm/kg⁻¹ and was more effective at 8 gm/kg⁻² (55, 42.7, 66.7, 58) gm /m².

Table 1. Allelopathic effect of test sorghum residues against weed test.

Treatments*	Weed Tests in Pots				
	<i>Beta vulgaris</i> L. <i>henopodium album</i> L		<i>Amaranthus retroflexus</i> L	<i>Malva R otundifolia</i> L	
	Weed density	Total			
Weedy check (Control)	86	90	95.7	80	351.7
Residues at 4 gm .kg ⁻¹ soil	64.7	63.3	47.7	62	237.7
Residues at 8 gm.kg ⁻¹ soil	46.3	40.3	26	27	139.6
LSD ≤ 0.05	12.99	7.27	16.83	8.01	-----
	Plant dry weight biomass (mg)				
Weedy check (Control)	165.3	223.3	228.3	185	801.9
Residues at 4 gm .kg ⁻¹ soil	81.3	89.3	106	68	344.6
Residues at 8 gm.kg ⁻¹ soil	55	42.7	66.7	58	222.4
LSD ≤ 0.05	23.11	36.99	31.47	17.68	-----

*Each number is an average of 3 replicates.

Effect of 50% full rate of trifluralin herbicide and sorghum residues cv. Enkath on population density and dry weight biomass of weeds in cowpea field.

The weeds *Cynodon dactylon* (L.) Pers, *Malva parviflora* (L.), *Convolvulus arvensis* L., *Portulaca oleracea* L., and *Beta vulgaris* L. dominated the cowpea field, according to the data. Over the control, all treatments considerably reduced weed density and dry biomass (Table 2). Incorporation of sorghum residues in field soil at 800gm m⁻² decreased weed population by 50% and weed dry weight biomass by 40.6 percent, respectively, over control. However, when a 50 percent full amount of herbicide was administered to plots altered with sorghum residues, the decrease was much greater. Weed density and weed dry weight were decreased by 66.0 and 63.9 percent over control, respectively, using a 50 percent full rate of trifluralin herbicide and sorghum residues at 800gm m⁻².

Table 2. Effect of 50% full rate of trifluralin herbicide and sorghum residues cv. Enkath on population density and dry weight biomass of weeds in cowpea field.

Treatments*	Scientific name					Total
	<i>Beta vulgaris</i> L	<i>Portulaca oleracea</i> L	<i>Convolvulus arvensis</i> L	<i>Malva tundifolia</i> L	<i>Cynodon dactylon</i> (L.) <u>Pers</u>	
Weed population						
Weedy check (Control)	57.3	130	49.7	16	70	323
Residues at 800 gm .m ⁻¹ soil	38	47.4	24	10.67	38.7	159.07
Residues at 800 gm.m ⁻¹ soil +50% of label rate of trifluralin	15.7	36	18	7.33	32.7	109.73
Label rate of trifluralin	17.7	20.3	13	5	13.7	69.7
LSD ≤ 0.05	8.47	7,33	7,93	5,61	14.95	-----
Plant dry weight biomass (mg)						
Weedy check (Control)	105	106.7	100	29	72	412.7
Residues at 4 gm .kg ⁻¹ soil	68	63.7	61.7	22.33	27.3	245.03
Residues at 8 gm.kg ⁻¹ soil	50.7	24.3	24	19.67	30.3	148,9
Label rate of trifluralin	35	24.3	12.7	9.33	22.3	103.6
LSD < 0.05	42.8	13.55	11.48	3.94	10.99	-----

*Each number is an average of 3 replicates.

Effects of a 50 percent full rate of trifluralin herbicide and residues of sorghum cv. Enkath on cowpea crop seed and biological yields.

Over the control group, both herbicide rate and residue application, as well as their interaction, substantially boosted seed and biological yields (Table 4). Trifluralin treatment at the label rate raised seed production by 74.19 percent and biological yield by 86.46 percent compared to the control. Sorghum residues were incorporated into field soil at an 800mg/m² concentration, which boosted seeds yield and biological yield compared to the control. However, combining sorghum residues with a 50 percent full dosage of trifluralin herbicide yielded the highest seeds yield (3.171.t.ha-1) and biological yield (18.34t. .ha-1.).

3.1. Components of Yield

In comparison to the control, the label rate of herbicide application resulted in greater yield component metrics (Table 5). Incorporating sorghum wastes into the field soil increased the number of seeds per pod, the number of plants per plant, and the weight of 500 seeds by 22, 48.1, and 2.7 percent, respectively, above control. However, combining a lower dosage of herbicide with sorghum residues at 800mg/m² resulted in larger numbers of seeds per pod, pods per plant, and 500-seed weight, which were 11, 2.2, and 42.7 percent higher than using the label rate of herbicide alone.

3.2. Plant Height Effects

When compared to the control, all treatments dramatically reduced cowpea plant height (Table3). However, there were significant differences between all of the therapies.

3.3. Index of Harvest

The treatments seemed to have a mixed effect on the harvest index. Plants grown in plots modified with 800 gm/m² sorghum residues had a considerably higher harvest index than control plants (Table 2). Control had the lowest harvest index of all the groups.

Table 3. Effect of different rate of trifluralin herbicide and decrease of sorghum residues cv. Enkath on some agronomic traits of *Vigna sinensis*.

Treatments*	Agronomic traits		
	Plant height (cm)	Biomass weight (ton.h ⁻¹)	Harvest index
Weedy check (Control)	53.50	9.54	24.98
Residues at 4 gm .kg ⁻¹ soil	49.20	10.44	27.85
Residues at 8 gm.kg ⁻¹ soil	42.5	13.28	27.57
Label rate of trifluralin	45.33	10.34	29.12
LSD ≤ 0.05	4.15	0.95	1.52

*Each number is an average of 3 replicates.

Table 4. Effects of different rate of sorghum residues cv. Enkath in combination with 50% full rate of trifluralin herbicide on seed and biological yields of *Vigna sinensis*.

Treatments*	Seeds yield (t/ha)	Biological yield (t/ha)
Weedy check (Control)	3.17	12.71
Residues at 4 gm .kg ⁻¹ soil	4.02	14.4
Residues at 8 gm.kg ⁻¹ soil	5.05	18.34
Label rate of trifluralin	4.27	14.70
LSD ≤ 0.05	0.30	1.16

*Each number is an average of 3 replicates.

Table 5. Effects of 50% full rate of trifluralin herbicide and residues of sorghum residues cv. Enkath on yield components of *Vigna sinensis*.

Treatments*	Yield components		
	Number of seeds per. pod	Number of pods per. plant	Weight of 500 seeds (g)
Weedy check (Control)	5.3	9.67	107.0
Residues at 4 gm .kg ⁻¹ soil	6.6	14.33	109.9
Residues at 8 gm.kg ⁻¹ soil	7.4	15.33	149.9
Label rate of trifluralin	6.6	15.0	105.0
LSD ≤ 0.05	0.63	2.55	9.67

*Each number is an average of 3 replicates.

4. Discussion

In addition to allelopathy, impedance between plant species or cultivars may be caused by opposition, allelopathy, or competition in certain circumstances. Under normal or regulated settings, such impedance may result in the preponderance of a single animal type or cultivar, as well as the disappointment of a particular time [7,27]. Because the two cultivars showed no significant differences in plant height or vegetative biomass, the differential growth and population variety seen on weeds formed in the stands of test sorghum cultivars could not be attributed to competition [28]. The remainder of the instrument in charge of the predominance of Enqath cultivar on weeds test was then allelopathy. The concealment of weed population and biomass by sorghum deposits consolidated into the field soil in the exhibit suggests that the buildups contain water dissolvable allelochemicals. When ingested by sprouting weed seeds, it impeded their germination and subsequent seedling growth, contributing to the weed group's overall loss in thickness, energy, and stand foundation [29]. Higher accumulation fuse rates resulted in more pronounced weed impediment. These findings are in line with those of [30,31], who found that concealing effectiveness against wheat and mung bean weeds was directly proportional to deposit dose. The expansion of allelopathic mixtures released from the

buildups into the field soil may be attributed to the expansion of phytotoxicity against weed thickness and biomass as a result of increased deposit rate in soil. A few analysts accounted for comparative results in sunflower and other plant species [32-34]. The results of the current investigation (Table 2) revealed that the test cultivars' allelopathic effect was maintained in both root exudates and buildups. The thickening of cultivar buildups in the field soil restricted the thickness and biomass of weeds that had formed in the cowpea field. The reduction in weed thickness and biomass is almost certainly due to the inhibitory effects of sorghum deposits. The introduction of phytotoxic allelochemicals from sorghum deposits in the immediate neighborhood during their degradation by soil microorganisms is thought to be the cause of this decline, that a few microbes play a role in the breakdown of rice deposits in soil, releasing phenolics and short unsaturated fats, among other allelopathic compounds. Rice (1984) showed that a few kinds of soil microbes are involved in the degradation of plant buildups and the release of allelopathic mixtures that are harmful to a few weed animal species. Trifluralin is a component of the dinitroaniline herbicide complex, which acts as a mitotic inhibitor by interfering with cell division by obstructing microtubule assembly and preventing the growth of seeds rather than seedlings.

The concealing effects were more noticeable at the recommended dose than at the reduced (half) dosage. However, when a half-full dose of trifluralin herbicide was applied to plots with sorghum deposits at 800mg/m², the suppression of weed population and dry biomass was comparable to that achieved by the entire rate, suggesting the possibility of halving herbicide dosage. This finding supports the goals of the current study and backs up a previous notion given by [35] that a herbicide in combination with allelopathic circumstances might enjoy integral cooperation, limiting herbicide usage for weed control in field crops. When working in tandem with allelopathic circumstances, it seems that a lower dosage of herbicide may be possible to provide adequate weed control. Sorghum deposits alone or in combination with half full rate of trifluralin herbicide resulted in decreased weed-competition for any of the growth parameters that may have contributed to greater yields, according to all reports. It gives the idea that weed control was simply transformed into yield, with the objective of achieving a significant yield change over control by the consolidation of sorghum buildups into field soil. The more evident accessibility of development components to cowpea plants may be attributed to increased vegetative biomass, bigger number of branches, and longer pod length compared to the control. The growth of the collect file as a result of buildups application alone or in combination with the half full rate of trifluralin herbicide suggests that a significant amount of weed concealing supplements are translocated to grain development rather than to Cowpea vegetative structures. Changes in trim yield and associated components as a result of coordinating allelopathy with half full rate of trifluralin herbicide are consistent with previous findings [36-38]. The weeds are smothered, and the buildups have a good impact on the physical and natural features of the soil, as well as the supplement status of the soil. Natural issue content, water holding capacity, and soil mass thickness were all found to be significantly higher in plots with plant growth [38].

Conclusion

The application of Sorghum bicolor residues in conjunction with a 50 percent rate of trifluralin boosted biological yield and harvest index of *Vigna Sinensis* L. crops. Conclusion: Sorghum bicolor residue might be employed as a realistic and ecologically sound weed management and soil enhancement strategy for *Vigna Sinensis* growing crops.

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