

Weed Management in Sesame Field (*Sesamum indicum* L) Using Wheat Straw and Tillage or no Tillage Systems

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Abstract: A field trial was achieved to test the response of weed and sesame crop to use wheat straw and tillage or no tillage systems. The experiment treatments were include; no tillage without straw, tillage without straw, tillage with straw, incorporated with soil and straw as cover crop (no tillage). The result shown that weed density and biomass have high significantly suppression when wheat straw applied as cover crop and without tillage soil compared with soil tillage without straw treatments, while no significant different noticed between treatment that no tillage without straw and tillage with straw incorporated with soil treatments. Using wheat straw as cover crop significantly improved sesame yield and yield components about 50% more than using wheat straw as incorporated with soil treatment and no tillage without straw treatment. This increase in sesame yield can be attribute to amended of capsules number per plant (53.2 capsules) and number of seed per capsule (54.6 seed) compared with 18.1 capsules per plant and 53.6 seed per capsule in tillage without straw treatment . The results of this study have led to the conclusion of possibility using wheat straw hopeful approach to amended sesame planting when used as cover crop.

Keywords: Wheat Straw, Allelopathy, Weed, Tillage System, (*Sesamum indicum* L)

Introduction

Weeds are serious pest damage for the most crops caused by competition on light, nutrients, moisture and space and this lead to enormous reduction in crop yield (Lahmod and Alsaadawi, 2014). The application of herbicide to weeds control has been a major factor enabling the intensification of agriculture, however, the excessive using of herbicide will be increasing herbicide resistance in weeds and extensive concern about adverse environmental effects (Stephenson, 2000). Additionally, highly costs for weeds management and agricultural production. To avoid these problems, it has been suggest a new approach of weed control which can be inexpensive, easy and helpful in maintaining the ecosystem and biodiversity (Alsaadawi and Dayan, 2009; Lahmod and Alsaadawi, 2014). There are many weed management techniques that can be lead to reduced herbicide dependence, as direct-seeding, competitive varieties, increased seeding rates, strategic fertilizer placement, growing silage and cover crops, all these have excellent potential to suppress weed growth (Harker and Blackshaw, 2009). Crop residues hold a

great prospect for meeting some of those demands and have more readily applicable in agro ecosystems (Alsaadawi *et al.*, 2013; Testa *et al.*, 2014; Sgroi *et al.*, 2014). This approach (Crop residue) can be used in weeds management by two ways; it can be used by selecting an appropriate residue of crop variety then incorporating it in soil, Also it can used by applying residues or straw as mulches on soil surface in a rotational sequence that allows residues to remain in the field (Alsaadawi and Dayan, 2009). However, each of the above has possible strategies. The crop residues are the most successful, effective and readily available (Lahmod, 2012; Clark, 2012; Spiertz, 2013). The cover crop is a one of strategies which can be suppressive weed and enhance of yield without environmental pollution as a secure approach to the world's food supply for future of generations (Finney and Creamer, 2008). Crop residue have been provide a maintained of agro ecosystem through lessening of erosion, water conservation saving, increase biological diversity (e.g., microbes, insects and birds), increase nutrient cycling and biological nitrogen fixation, increase soil organic matter and improve weed control (Hoffbeck *et al.*, 2008; Clark, 2012) and increase

crop yields, therefore, using wheat residue (straw) as a mulch or incorporate in soil can be helpful to weed control of sesame crop and enhancement of seeds yield. In order to assess that this study was done.

Materials and Methods

Site Description

The proposed study was conducted at Research Farm of Biological science Department, College of Science, University of Baghdad, Baghdad, Iraq (33.2 N latitude and 44.22 E longitude, 30 m above sea level). The soil of experimental site was calcareous silt clay loam. Organic carbon, pH and EC were 0.8%, 7.8 and 3.0 dS m⁻¹, respectively. The average annual rainfall is less than 50 mm and day/night temperatures during the growing season were 30-40/15-30°C.

Prepare Straw of Wheat Plants

To prepare straw of wheat plants, field plot (24×2 m) by four replicates were tilled twice in the first of November 2012 in the Research Field of Biological Department. Grains of wheat cv. Abu-Grab were manually sown in all plots in 20 cm apart crop rows at seed rate of 120 kg ha⁻¹. Urea as Nitrogen fertilizers (46% N) and triple super phosphate (46% P₂O₅) were applied to these plots which recommended for wheat crop and irrigation were applied as recommended for this crop. At the maturity stage, Biological yield of wheat crop was harvest at 30cm from stem height and left the straw on the soil surface. After harvesting stage, plots were subdivided into plots measuring 8×2 m as experimental treatments. The half of these plots were removed wheat straw while the other half were left on soil surface. Half plots that received straw and remove straw were tilled at mid of June 2013 by using a disc plough to incorporate with the soil. While, the other half were left without tillage. Fertilizers Nitrogen as urea (46% N) and phosphorus as triple super phosphate (46% P₂O₅) were applied to these plots as recommended for sesame crop. Seeds of sesame was sown in 60 cm spaced crop rows with 20 cm among beds of seeds. All plots received equal irrigation water during the entire course of study. The experimental treatments were the following:

1. No tillage without straw
2. Tillage without straw
3. Tillage with straw incorporated with soil
4. Straw as cover crop (no tillage)

Measurement of Traits

The traits measured were weed density (plant.m⁻¹), weed biomass (g.m⁻¹), plant height, number of

branching, number of capsules per plant, number of seeds per capsule, 100-seed weight and yield (t.ha⁻¹).

Results

Weed Growth

Weed flora was dominated the experimental site during growth season comprised of *Echinochloa colonum* (L) Link, *Cyperus rotaundus* L., *Portulaca oleracea* L and *Cyndon dactylon*. The weed density and biomass were high significantly suppression noticed when wheat straw applied as cover crop without tillage soil compared with treatments that tillage without straw, while not significant different noticed between treatment that no tillage without straw and tillage with straw incorporated with the soil treatments. Wheat straw as cover crop without tillage system reduced weed density to 6.10 plant per m² and weed biomass to 5.09 g per m² compared with 30.33 plant per m² (weed density) and 89.89 g per m² (weed biomass) that showed in tillage system treatment and without wheat straw. The incorporation of wheat straw in soil reduced weed density to 19.33 plant per m² and weed biomass to 25.53 g per m² while 21.67 plant per m² and 35.71 g per m² weed density and weed biomass respectively) reduction was noticed when soil no tillage without straw as shown in (Table 1).

Plant High and Number of Branch in Sesame

No significant different in plant high was noticed in all treatment However, showed increased by 17% when straw applied as cover crop without tillage compared with straw when incorporated with soil. The Number of branches per plant of Sesame were recorded highest increased when wheat straw was applied as cover crop (no tillage) treatments. While these branches were the lowest when tillage soil without straw treatments (Table 2).

Sesame Yield and Yield Components

Using wheat straw as cover crop improved sesame yield significantly and yield components about 50% more than using wheat straw as incorporated in soil treatment and no tillage without straw treatment, while the lowest sesame yield by 75% less than wheat straw as cover crop without tillage (Table 3). However, yield and yield components were lowest in treatment that was tillage without straw presumably due to high weed pressure in terms of weed density and dry biomass that was noticed (Table 1) in this treatment. The advance increase raise of sesame yield in straw as cover crop (no tillage) was due to high number of capsules per plant (53.2 capsules) and number of seed per capsule (54.6 seed) compared with 18.1 capsules per plant and 53.6 seed per capsule in tillage without straw treatment. A bigger weight of 100 seed was recorded in straw incorporated in soil and straw as cover crop (no tillage) treatments.

Table 1. Weed density and Weed biomass after different wheat straw treatment with sesame crop

Treatment	Weed density (plant.m ⁻¹)	Weed biomass (g.m ⁻¹)
No tillage without straw	21.67	35.71
Tillage without straw	30.33	89.89
Tillage with straw incorporated with soil	19.33	25.53
Straw as cover crop (no tillage)	6.33	6.05
L.S.D 0.05	6.10	5.09
Cv	15.70	6.50

Table 2. Plant high and number of branches to sesame crop under different wheat straw treatment

Treatment	Plant high (cm)	Number of branches per plant
No tillage without straw	151.2	2.330
Tillage without straw	163.8	0.670
Tillage with straw incorporated with soil	148.2	2.080
Straw as cover crop (no tillage)	178.9	4.330
L.S.D 0.05	NS	0.891
Cv	8.7	19.100

Table 3. Yield and yield components of sesame crop under different wheat straw treatment

Treatment	Number of capsules per plant	Number of seed per capsule	Weigh of 100 seed (g)	Yield of seeds (kg. ha ⁻¹)
No tillage without straw	26.00	69.10	0.22	495.7
Tillage without straw	18.10	53.60	0.25	297.3
Tillage with straw incorporated with soil	23.30	43.70	0.34	452.5
Straw as cover crop (no tillage)	53.20	54.50	0.32	1184.1
L.S.D 0.05	9.41	15.27	0.01	217.8
Cv	18.00	13.80	2.40	18.0

Discussion

The results on this study shown that using wheat straw as cover crop with no tillage soil system improve yield and yield component of sesame. This amended in yield can be justified to the lowest weed density and suppression growth it (Table 1), following, that will be decrease the competition between crop and weeds on space, water and nutrient in soil. The present wheat residue (straw) on soil surface as cover crop can be prevent sun light (radiation) to reach weeds seedling in field, as well as, released some of allelopathic compounds from wheat residue which can be suppression weed seed growth in soil (Roth *et al.*, 2000; Clark, 2012). Tillage the soil increased weed growth because present high seed number of weed in soil (soil seed bank) that can be exit in to soil surface by tillage. Incorporated of wheat straw in soil perhaps suppression some weeds caused by released allelocimicals component from residues (Lahmod and Alsaadawi, 2014). Nevertheless, these components do not along stay because decomposing and leaching it from soil depth of which can be caused recurrent weed growth and competition of crop in next time (Lahmod, 2012). In addition to lowest weed competition, wheat residue can be keeping of soil moisture and assist of available soil nutrient (Finney and Creamer, 2008). All these factors were contributed of enhance sesame growth (Table 2) and increased number of capsules per plant and number of seed per capsules which caused by positive increased of seed yield sesame per hectare (Table 3).

Conclusion

From these results, it can be conclude the possibility of using wheat straw as hopeful approach to amended sesame planting when used as cover crop.

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Author's Contributions

Srra'a Nsayef Muslim Al-Eqaili: Application of field experiment and record data and contributed to the writing of the manuscript.

Nabil Raheem Lahmod: Designed the research plan and field experiment, analysis of data and writing of the manuscript.

Oda Hassuni Eshkandi: Contributed by some field working and funding of research.

Muhammad K. Altai: Coordinated the mouse work.

Ethics

This article is original and contains unpublished material. The corresponding author confirms that all of the other authors have read and approved the manuscript and no ethical issues involved.

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