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Allelopathic Effects of (*Sorghum bicolor* L.) Extracts on Germination and Seeding Growth of (*Triticum aestivum* L.).

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KEYWORDS

Allelopathy, sorghum, shoot, root, extracts, radical, plumul, germinations.

A B S T R A C T

In order to investigating the allelopathic effect of different residue parts of (*Sorghum bicolor* L.) can positively or negatively affect growth, vegetation and germination of wheat an experiment was conducted at laboratory in college of science of Kirkuk university during 2015 as completely randomized design with three replications . Aqueous extracts from shoot and root from (*Sorghum bicolor* L.) and different concentrating of these extract (0, 25, 50, 75 and 100%) were the treatments. Results showed that germination percentage and speed, rate of plumuls and radical length in (*Triticum aestivum* L.) was significantly affected by different (shoot and root extracts, sorghum shoot had the highest inhibitory than root) root or shoot extracts. However, 100 concentration of extract caused the most reduction in all properties of wheat compared to control.

Introduction

Allelopathy is an important ecological mechanism that plays an appreciable role in the plants dominance, plant succession, formation of communities and climax vegetation and crop productivity (Chou, 1999). In crop association or natural stands, besides nutrient, water, light and space competition, there is allelopathic interference (Rice, 1984), which is direct influence of chemicals released from one plant on the development and growth of another plant (Gibson and Liebman, 2003 ; Mafeo *et al*, 2010), which is inhibitory or stimulatory effects of one plant on another (Rice, 1984).

Allelopathic compounds may be released to environment by volatilization through acrial parts of the plant, Leaching of acrail parts of the plant by rain, fog, and dew, exudation through the roots from plant litter, decomposition of the organic matter (Chang, 1999). Plant produces and stores large amounts of primary and secondary metabolites that escape through environment and influence the growth of associated plant

species (inter specific interaction, or hetero toxicity) or other growth (intra specific interaction auto toxicity Roberts and Wink, 1998).

Many researchers investigated the effect of plant extracts on the germination and growth of plant (Alsaadawi *et al*; 1993; Zwein, 1996; Ben-Hammoude *et al*; 2000; Saied, 2004). Moreover, research findings indicate that a given crop species only some accessions or varieties have allelopathic effects as reported in barley, oats, rice, wheat and alfalfa (Chon and Kim, 2002, Ebana *et al*; Kato-Noguchi and Ino, 2001). Additionally, some crop plants have auto-toxicity, which is atypical type of allelopathy in which plants have inhibitory effect on other plants of some species (Jensen *et al*, 1981). Straw extract was inhibitorier, while other leaf extract was more retardant. Reports show that wheat (*Triticum aestivum* L.) allelopathy has the potential for management of weeds, pests and discases (Wa, *et al*., 2001). Allelopathy also has been used for intercropping, nutrient recycling and low external input farming practice (Chou, 1990) and effect nutrient uptake Alam, *et al*., 2001). Allelopathic compounds influence physiological processed such as seed germination. Cellular expansion, activity of specific enzymes, pollens, cell wall construction and mineral uptake (Rice, 1984; Wink and Tuordowski, 1992).

The objective of this research were to determine under laboratory condition, to see which part of the plant has more inhibitory effect. Their allelopathic potential of Sorghum (*Sorghum bicolor*) on germination and early growth of wheat (*Triticum aestivum L*.).

Materials and Methods

In order to investigating the effect of (Sorghum) residue on germination and seeding growth of wheat (*Triticum aestivum L*.) an experiment was conducted in 2015 (25th november) at the plant laboratory of the department of Biology faculty of science college, Kirkuk university.

Experimental design as a factorial based on CRD with three replication for each concentration (0, 25, 50, 75, 100%).

Preparation of Equose Extracts

Sorghum bicolor were separated each into shoot and root then dried at 65Co for three days in forced draft oven and ground to pass 1mm screen, 20 grams of either shoot or root were placed in 250 ml conical flask and added distilled water till the volume became 200ml (wardle *et al*, 1992). The mixture was stirred for 20minutes and left in room temperature for 72hr. The extracts were filtered with three layers of cheese cloth followed by what man No.1 filter paper.

Extract were left in refrigerator at 4Co till use, extracts of shoot and root from sorghum at different concentrations these extract (0, 25, 50, 75, 100%) were the treatment.

Bioassay of Germination & seedling growth, In this study wheat (*Tritecum aestim L*) were used as test crops. Seeds of wheat were sterilized in 2% sodium hypochlorite for 20min and finally washed several times with distilled water. In laboratory 20 seeds were placed in each petri dish and placed in the dark at 25 Co, then each Petri dish was applied to 5ml of extracts (Shoot & root extract of Sorghum) and water was used as control. 7th day after seeding, germination percentage counts, Plumuls and central radical length were measured and recorded. Seeds were considered germination when the radical extended through the seed coat. Total plumuls and radical length of seeding was measured. The percentage of inhibition was calculated following the formula for warded by (Chung *et al* 2003).

Results and Discussion

Effect of sorghum shoot and root extracts on germination percentages and speed, total of plumul and radical length in wheat seeding in laboratory experiment are presented in Table 1 and 2, respectively. Extracts were significantly affected by different Sorghum root and shoot extracts, result show that germination percentage and speed where inhibited compared to control. (Oussama, 2003) found that durum wheat leaf extracts significantly affected germination of wheat.

According to results, sorghum shoot and root extracts had the highest and lowest affect in terms of mentioned traits respectively, (Fig.1, 2).

Some mechanisms of action of allelopathy seem to resemble those of synthesis plant hormones (Kruse, *et al*, 2000). Thus these compounds probably affect inducible hormones of germination such as gibberellin (Rice.1984; Krus *et al*., 2000) or activity of specific enzymes such as amylases and proteinases, which are necessary for seed germination (Rice, 1984) there for decrease of germination percentage is expected in the treated seeds with these allelopathy.

Effect of sorghum shoot and root extracts on seeding plumul and radicals length of wheat are presented in Table (1, 2). Extracts from shoots of sorghum significantly reduced the total plumul and radicals length (reduction was 22.2, 38.8, 72.2 and 77.7%), (40, 60, 68 and 80%) in concentration (0, 25, 50, 75, 100%) respectively compared with control (Fig 1, 2) and this decreasing increases with increasing the concentration of extracts.

Different effect of sorghum shoots extract on wheat could be explained that the extract might contain different substance, plumul growth are less sensitive to allelopathic affect compared to roots (Tefera, 2002).

On the other hand stimulatory effect of sorghum root extract on plumula length might be due to lower concentration of allelopathicals in sorghum root extract and this low concentration is stimulatory to growth.

Sorghum root extract also reduced significantly both plumul and radicals' length compared to control and the inhibition increase according to the increasing of concentration of extract, While variable effect of sorghum shoot extract might be due to reduction of allelopathic effect with age of the crop as contains leaf parts was more phytotoxic than root.

Table.1 The effect of shoot aqueous extract of sorghum on some growth properties of wheat.

Concentrations %	Germination %	Germination Speed(seed/day)	Plumul length(cm)	Radical length(cm)
0	100	1.43	1.8	5.0
25	93	1.32	1.4	3.0
50	90	1.28	0.7	2.0
75	86	1.22	0.5	1.6
100	83	1.18	0.4	1.0
L.S.D 5%	3.0	0.3	0.2	0.8

Table.2 The effect of Root aqueous extract of sorghum on some growth properties of wheat.

Concentrations %	Germination %	Germination Speed(seed/day)	Plumul length(cm)	Radical length(cm)
0	100	1.43	1.8	5.0
25	96	1.37	1.6	3.5
50	93	1.32	1.2	2.7
75	86	1.20	0.7	2.0
100	83	1.18	0.5	1.2
L.S.D 5%	4.0	0.4	0.3	1.0

Figure.1 The reduction % in some growth properties of wheat by shoot aqueous extract of sorghum

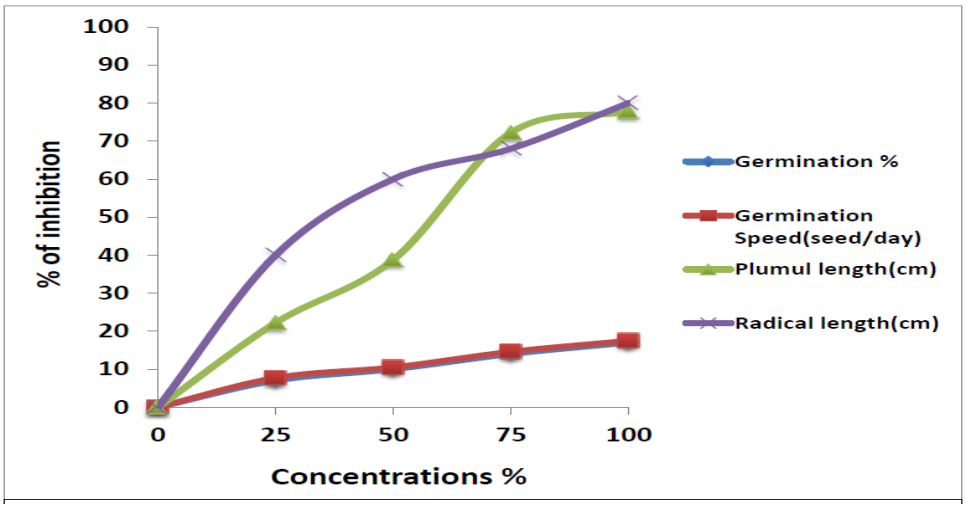
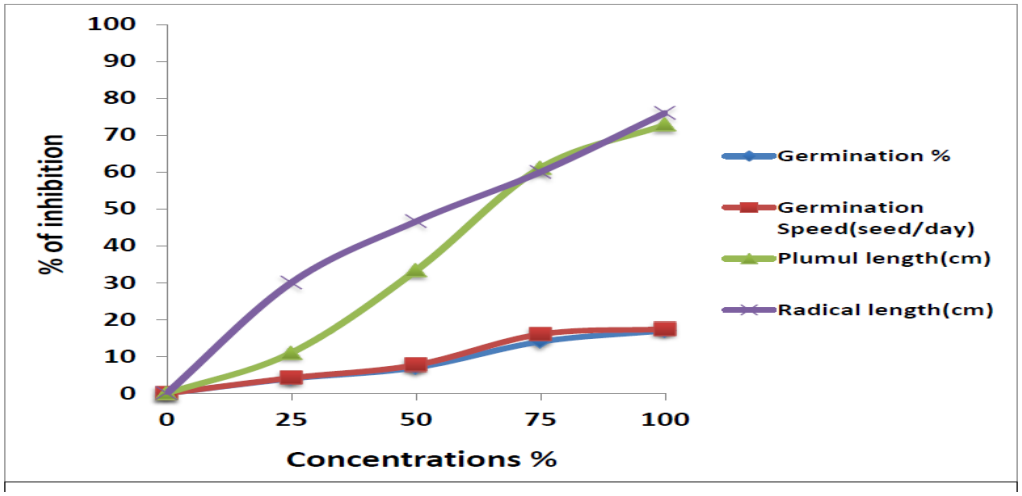


Figure.2 The reduction % in some growth properties of wheat by root aqueous extract of sorghum



(Economon *et al*, 2002) noticed that leaves of *conyza albida* had more allelopathic effect than stems, sensitivity of root to allelopathic effect could be attributed to its direct contact with the extract during bioassay. The mechanism of growth inhibition by allelopathic substances might be, as a result of reducing cell division and elongation.

Conclusion

Different *sorghum bicolor L*; shoot and root extracts significantly decrease germination percentage and speed and rate radical and plumuls length in wheat (*Triticum aestivum* L.) in laboratory experiment Sorghum shoot and root extracts had the highest and lowest effect in the terms of mentioned traits respectively .The results of the laboratory experiment of this study indicate clearly that inhibitory substance are present in extracts of Sorghum these substances their strong potential for resource-based competition on wheat grown under field conditions, could potentially influence initial growth and yield of wheat, the resource –based interference during the first 4 weeks after wheat planting in able to reduce significantly the yield of wheat. Therefore control of possible release of their allelopathic substances.

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