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EFFECT OF RICE RESIDUES ON SEED GERMINATION AND SEEDLINGS GROWTH OF WHEAT (*Triticum aestivum* cv. IPA) AND BARLEY (*Hordeum vulgare* cv.Local)

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SUMMARY

The effect of different sources of rice (*Oryza sativa* cv. Ember) residues; straw, dry root, burned straw, and burned root on wheat (*Triticum aestivum* cv. IPA) and barley (*Hordeum vulgare* cv. Local) germination and seedling growth was investigated. Extracts of residues were used at concentrations of 1%, 2%, and 4% (w:v). Whole residues were used at rates of 10, 20, and 40 g/kg soil. Seed germination, shoot and root length, reduction in dry weight , chlorophyll content, and electrolyte leakage from leaf cells expressed as injury were measured.

The results showed as the concentration of the extracts or rate of whole residues increased, all the growth parameters studied decreased also in both crops except injury to seedling which increased in proportional to increasing concentrations. Ground root extracts and whole residues were the most effective in reducing germination, root length , shoot length, chlorophyll content and dry weight. For whole residues, burned root was superior in increasing injury to wheat leaves while ground root was more

effective in increasing injury to barley leaves. For the interaction, ground root extract at 4% or ground root of whole residues at 40g/kg soil had the most inhibitory effect in most cases.

INTRODUCTION

Plants produce a wide variety of compounds or secondary metabolites which secreted to the environment to effect the growth and development of other plants (Einhelling, 1995 (a) ;Olofsdotter,1998; Jones et al 1999; and Kudsk et al 2001). These compounds which called allelochemicals affect multiple physiological functions in plants such as seed germination, cell division and elongation , photosynthesis, respiration, membrane permeability and, therefore, total plant growth (Rice, 1984). The mechanisms at which allelochemicals have their effect on plant growth and development remain unknown(Rice,1974).

Crop residues are known to have allelopathic effect. Chou and Lin (1976) found that the aqueous extracts of rice residues inhibited the radical growth of lettuce and growth of rice seedlings. Gawronska et al (2001) found that wheat germination did not decrease ,while mustard germination reduced strongly by the aqueous extracts of sunflower leaves. Also, wheat root growth reduced by 50% using canola aqueous extractions. Total growth of wheat was suppressed using canola and lentil residues (Moyer and Huang,1997). In addition, photosynthesis may be reduced by allelochemicals causing diminished total plant growth. Allelopathic compounds may interfere with the synthesis of prophyrin,precursors of chlorophyll biosynthesis,(Rice,1984). A reduction in chlorophyll content was found in soybean plants treated with aqueous extracts of velvet leaf (Cotton and Einhelling,1980) and in rice seedlings treated with three allelopathic phenolics (Yang et al,2002).

Phenolic acids, as the main allelochemicals in plant residues, may also affect plasma membrane leading to growth reduction. Einhelling (1995 b) proposed that growth reduction is the result of influencing of phenolic acids on some physiological events due to their effect on plasma membrane. Loss of plasma membrane integrity because of some injurious effects has been shown to cause leakage of solutes and other cell contents (Levitt ,1980; Ingram,1985). Therefore, solutes leakage used as a criteria to define injury to the membranes.

The effects of plant residues on subsequent plants in crop rotation has been widely studied (Tamak et al 1994 ; Moyer and Huang, 1997; and Crocker, 1998). In Iraq, farmers use to cultivate wheat and barley and rice alternatively in the same land year after year especially in the middle

Euphrates region of Iraq. Therefore, the allelopathy among these crops should have a pronounced effect on plant growth and development. The purpose of this study was to determine the effect of rice residues on seed germination and seedlings growth of wheat and barely.

MATERIALS AND METHODS

Collection of Rice Residues

Samples of straw and roots residues of rice (*Oryza sativa* L. cv. Ambar 33) were collected separately from previously harvested farms in Al-Shamiya/ Al-Qadisiya province in Dec. 2002. Residues were cleaned thoroughly with tap water before air dried for several days at room temperature. Then, they were ground to pass through a 3-mm sieve. Some of the ground residues were burned to produce ash.

Preparation of the Extracts

The way for extraction of plant samples was according to Hedge and Miller (1990). Separate extracts were made of dry ground straw, dry ground root, burned straw, and burned root at concentrations of 1, 2, and 4% w: v of dry matter. Plant material was extracted with distilled, sterilized water. Extraction was done for 12 hours using platform shaker. After extraction, coarse plant material was removed and extracts were centrifuged at 12,000 rpm for 20 min. The extracts were stored at the refrigerator in dark bottle to reduce the allelochemicals degradation.

Extracts Bioassay Technique

Seeds of wheat (*Triticum aestivum* cv.IPA 95) or barley (*Hordium sativum* cv.Local) were used in this experiment. Seeds were sterilized in 70% ethanol for 20 min , then in 2% sodium hypochlorite for 20 min and finally washed several times with distilled water. Twenty five seeds per replicate were placed in Petri-dishes filled with 60 gram of well washed sand. A 15ml of extract was added to each Petri dish. The Petri-dishes were placed in the lab under normal conditions (room temperature). Distilled water was used for control treatment. An additional several ml of extracts was added daily as required.

Whole Material Bioassay Technique

Pots of 9-cm diameter filled with 1kg loam soil were used for this experiment. Rice residues of ground dry roots, ground straw, burned roots, and burned straw were used at rates of 10, 20, and 40 g/kg soil which was equivalent to some how to the extract concentrations used in extracts

bioassay. Peat moss was added at the same rates for control treatment. Residues mixed completely with the pots soil. Seeds of wheat and barley were sown to the pots at a rate of 25 seeds per pot. Pots were placed in lath house and watered as required.

Determination

Germination percentage:

Germination percentage was taken on the 10th day of germination for both experiments.

Growth determination:

Measurements of plant growth were taken on four week old plants for the extracts experiment and on seven week old plants for the whole residues experiment. They included; shoot and root length, and reduction in dry weight.

Chlorophyll determination:

Concentration of chlorophyll in leaves was determined according to Porra et al (1989) method. Absorbance was measured with a Hitachi U2000 uv-visible spectrophotometer.

Injury determination:

Electrolyte leakage from leaves was measured according to Rajashekar and Burke (1986) method. The degree of injury of each treatment was calculated as follow:

$$\% \text{ Injury} = 1 - \frac{1 - (T1/T2)}{1 - (C1/C2)} \times 100$$

(Martineau et al 1979)

Where T and C refer to treatment and control and the subscripts 1 and 2 of T and C refer to initial and final conductance, respectively.

Experiments were arranged according to CRD. All data were subjected to analysis of varience and means were compared using LSD at 5% (Al-Rawi and Al-Ani, 1990).

RESULTS AND DISCUSSION

Wheat germination was significantly reduced by all kinds of extracts at all concentrations used (Table 1). Ground root extract was the most effective in reducing germination. Other kinds of extracts reduced

germination also but they were similar in their effect. As the concentration of the extract increases , the germination percent decreases also. The least germination percent obtained at 4% (71%). Similar inhibitory pattern for barley seed germination was found (Table 1). All extract concentrations reduced germination significantly in compare to control treatment. It seemed that this pronouncrd reduction in seed germination and other growth parameters as it would be seen later in this article indicate that rice residues contain water-soluble toxic substances released to cause a negative effect on plant growth. Previous reports indicated a reduction in seed germination and seedling growth of wheat, avena, and lemna using rice or sunflower water extracts (Narwall and Willis,1999; and Gawronska et al , 2001). There were no significant differences in seed germination using different kinds of residues but all residues decreased germination in compare to control. Interaction between kinds of residues and extract concentrations was significant for both wheat and barley. The least seed germination was found using extract of ground root at 4% which was 58% for wheat and 66% for barley. Using whole rice residues, all kinds had negative effect on wheat seed germination but not for barley. In contrast, using different rates of residues showed no significant effect on wheat germination but they did have negative effect on barley. Chou and Lin (1976) identified several allelopathic compounds from rice water extracts which showed a reduction in rice plant growth up to 70%. These phenolic compounds are; p-coumaric, vanillic, ferulic, syringic, and p-hydroxybenzoic. However, ground root residues were the most effective in reducing germination for both crops. For the interaction, and similar to that for the extracts, ground root at 4% was the most effective.

Initial root growth was affected by all rice residues used (Table 2). In general, ground root residues had a more inhibitory effect on root length than other kinds of residues of both crops. Increasing extract concentration from 1% to 4% or whole residues rate from 10 to 40 g/kg soil was accompanied with a reduction in root length. Wheat root length reduced by 28.28% and 31.78% using extracts or whole ground root residues respectively in compare to control. The reduction in barley root length was 34.31% for ground root extracts and 34.46% for whole root residues. Also, the results showed differences in the allelopathic potential between residues from vegetative parts and roots which may indicate that the alelochemicals occur in substantial amounts in roots. These results are in accordance with the results of Al-saadawi et al ,1985 who found that root leaches of different varieties of sorghum caused significant reduction in seed germination and growth of *Amaranthus retroflex* . For interaction,

ground root extract at 4% or whole residues of ground root at 40 g/ kg soil gave the least root length for both crops.

Table.1. Effect of residues extracts and whole residues of rice on germination of wheat and barley.

Test Crop	Rice Residues	Germination (%)					
		Extract conc.			Residues rate (g/ kg soil)		
		١٪	٢٪	٤٪	١٠	٢٠	٤٠
		mean			mean		

Wheat	Control	٩٥	٩٩	٩٥	٩٥	٩٤	٩٦
	Ground straw			٩٦,٣٣			٩٥,٠٠
	Ground root						
	Burned straw	٨٨	٨٤	٧٣	٩٠	٩٠	٩٣
				٨١,٦٦			٩١,٠٠
	Burned root						
	mean*	٨٠	٧٤	٥٨	٨٨	٨٤	٧٩
				٧٠..٦٦			٨٣,٦٦
		٩٠	٨٢	٧٦	٩٠	٩٢	٨٨
Barley				٨٢,٦٦			٩٠,٠٠
		٨٨	٨٢	٧٧	٨٧	٩٠	٨٥
		٨٢,٣٣		٨٦,٥			٨٧,٣٣
			٨٠,٥	٧١,٠	٨٨,٧٥	٨٩,٠	٨٦,٢٥
	L.S.D. ٥٪	Among kinds of residues= ٧,٥ Among concentrations= ٥,٦ Interaction= ١٠,٥			Among kinds of residues= ٤,٥ Among residues rate= N.S Interaction= ٨,٣		
	Control	٩٢	٩٤	٩٤	٩٣	٩٠	٩٠
	Ground Straw			٩٣,٣٣			٩١,٠٠
	Ground root						
	Burned straw	٨٧	٨٠	٧١	٩٣	٨٨	٨٥
				٧٩,٣٣			٨٨,٦٦
	Burned root						
	mean*	٨٠	٧٧	٦٦	٩٠	٨٥	٧٥
				٧٤,٣٣			٨٣,٣٣
		٨١	٧٥	٦٨	٨٨	٨٧	٨٠
				٧٤,٦٦			٨٥,٠٠
		٧٨	٧٢	٧٠	٨٥	٨٥	٨٥
				٧٣,٣٣			٨٥,٠٠
		٨١,٥	٧٦,٠	٦٨,٧٥	٨٩,٠	٨٦,٢٥	٨١,٢٥
	L.S.D ٥٪	Among kinds of residues= ٨,٤ Among concentrations= ٧,٧ Interaction= ٩,٥			Among kinds of residues= N.S Among residues rate= ٣,٨ Interaction= ١١,٦		

Table.٢. Effect of residues extracts and whole residues of rice on root length of wheat and barley.

Test	Rice	Root length (cm)

		Extract conc.			Residues rate (g/ kg soil)		
		١٪	٢٪	٤٪ mean		١٠ ٤٠	٢٠ mean
Wheat	Control	١١,١	١٠,٠	١٠,٤	١٨,٢	١٨,٣	١٧,٦
	Ground straw			١٠,٥			١٨,٠٣
	Ground root	٩,٩	٩,٠	٧,٨	١٧,٧	١٦,٦	١٣,٤
				٨,٩٠			١٥,٩٠
	Burned straw	٨,٦	٧,٦	٦,٤	١٤,٥	١٢,١	٩,٨
	Burned root			٧,٥٣			١٢,١٣
	mean*	١٠,١	٧,٩	٧,٠	١٧,٨	١٥,٢	١١,٤
				٨,٣٣			١٤,٨٠
Barley		٩,٤	٨,٤	٧,٧	١٤,٤	١٤,١	١١,٦
			٨,٥٠		١٣,٣٦	١٦,١	١٤,٥
		٩,٥	٨,٢٢	٧,٢٢			١١,٥
	L.S.D. ٥٪	Among kinds of residues= ١,٢ Among concentrations= ٢,٢ Interaction= ٢,٣			Among kinds of residues= ٢,٣ Among residues rate= ٣,٠ Interaction= ٤,٤		
	Control	٩,٤	٩,٨	٩,٤	١٨,٩	١٦,٩	١٧,٣
	Ground straw			٩,٥٣			١٧,٧
	Ground root	٨,٢	٧,٦	٦,١	١٦,٦	١٦,٤	١٤,٥
				٧,٣ ٠			١٥,٨٣
	Burned straw	٧,١	٦,٢	٥,٥	١٣,٩	١١,٤	٩,٥
	Burned root			٦,٢٦			١١,٦
	mean*	٧,٢	٧,٠	٦,٠	١٤,٥	١٢,٢	١٢,٠
				٦,٧٣			١٢,٩
		٧,٢	٦,٦	٥,٦	١٥,٦	١٣,٢	١٠,١
				٦,٤٦			١٢,٩٦
		٧,٤٢	٦,٨٥	٥,٦	١٥,٥	١٣,٣	١١,٥٢
	L.S.D ٥٪	Among kinds of residues= ٢,١ Among concentrations= ٢,١ Interaction= ٢,٤			Among kinds of residues= ٢,٠ Among residues rate= ٢,٢ Interaction= ٢,٧		

* without control

With regard to shoot length (Table 3), a similar pattern to that of root length was found in general. Wheat shoot length reduced significantly by

all kinds of extracts. Also, there were significant differences in shoot length due to different rates of residues used. For barley, burned straw gave the least shoot length. As the concentration of the extract or residues rate increased, shoot length decreased also for both crops. Increasing extract concentrations or rate of residues resulted in more growth reduction in both crops. This may be due to increase concentration of toxic substances (Blum, 1998). These results agreed with the results of Tamak et al, 1994 who mentioned that using water extracts of rice at 5% and 10% concentration inhibited seed germination and seedling growth of wheat and lemna and also the results of Moyer and Huang, 1997 on wheat using canola water extract. For the interaction, ground root extract at 4% gave the least wheat shoot length (8.4cm), while ground straw at 1% gave the longest (13.2 cm) although it was less than that for the control. Using whole residues, ground root at 40g/ kg soil gave the least shoot length (15.2cm) , while ground straw at 40g/ kg soil gave the longest (25.5 cm). For barley, ground root and burned straw were more effective in reducing shoot length used either at 4% extract concentration or 40g/kg soil residue.

The effect of rice residues on wheat and barley chlorophyll content was significant in most cases($p<0.05$). A pronounced reduction in chlorophyll content was noted due to use of ground root extracts or whole residues of wheat (Table 4). Rate of residues had no effect on chlorophyll content in wheat leaves. Barley leaf chlorophyll content reduced significantly by all kinds of residues used either as extracts or whole residues. Several researchers have mentioned that chlorophyll content and ion uptake reduced significantly by allelochemicals (Epstein, 1976; and Al-saadawi et al 1986). Also, Bhatti et al 2000, noticed that as concentration of extracts or rate of whole residues increases, they resulted in negative effect on chlorophyll content. Same as with other parameters studied, the interaction between kinds of residues and concentration or rate of residues did affect the chlorophyll content. The least chlorophyll content was obtained using ground root extracts or whole residues at the highest concentrations for both crops. They were 375 and 390 for wheat and 370 and 390 for barley using extract concentrations or whole residues, respectively.

In accordance with the previous results, ground root and ground straw residues were more effective in reducing plant dry weight (table 5). Burned straw and burned root produced less reduction in dry weight for both crops. Increasing extract concentrations or whole residues rates caused more reduction in plant dry weight. These resutts are in agreement with the results of Bhatti et al 2000, who noticed that spraying water extracts of sorghum on some weeds at age of 15, 30, or 45 days caused a reduction in weeds dry weight by 45-58%. For the interaction, burned root extract at 1% and whole residues of burned straw at 40g/kg produced less wheat dry

weight reduction (29.6 and 30.7 respectively), while ground root extracts at 4% and whole residues at 40g/ kg soil produced more dry weight reduction (40.2 and 46.1 respectively). For barley, ground root produced more reduction while burned straw produced less.

Table.4. Effect of residues extracts and whole residues of rice on chlorophyll content in leaves of wheat and barley.

Test Crop	Rice straw Residues	Chlorophyll content (µg/g fresh weight)	
		Extract conc.	Residues rate (g/ kg soil)
	Control	٥٠٠ ٥٠٠ ٥١٠	٤٩٠ ٥١٠ ٥٠٥
	Ground straw	٤٦٥ ١٪ ٤٨٠ ٢٪ ٤٠٠ ٤٪ ٤٣٨,٣٣ mean	٤٨٠ ٤١٠ ٤٠٠ ٤٠ ٢٠ ١٠ ٤٣٣,٣٣ mean
Wheat	Control	٥٤٩ ٤٨٠ ٤٨٠	٤٥٧٠ ٤٥٣٠ ٥٩٠
	Burned root	٤٠٦ ٤٩٠ ٥٤٥,٣٣	٤٢٣,٣٣
	Ground straw	٤٥٩٠ ٤٣٥٠ ٤٧٠	٤٥٧٥٠ ٤٥٧٠٠ ٤٨٠
	Ground root	٤١٥ ٤٨٥ ٤٣١,٦٦	٤٥٥٤٩٠ ٥٢٣,٣٣
	Burned straw	٤١٣٥٣٠ ٤٣٨٥,٣٣ ٣٧٥	٤٢٤٤٥٠ ٣٩٥٠٠ ٤٣٧٠
	Burned root mean*	٣٨٦٥٢٥ ٤٢٥٥٥ ٤٥٦٤٨٥	٤٥٦٥٦٦٠ ٥٠٠ ٥٣٠
		٤٥٠ ٤٨٠ ٥٠٠	٤٥٧٣٦٧٥٦ ٤٣٧٥ ٤١٤
Barley	L.S.D ٥٪	Among kinds of residues= ٤٧٦,٦٦ ٤٦ ٤٢٥ ٤٥٦,٢٥ ٤٩١,٢٥ Among concentrations= ٣٩	Among kinds of residues= ٥٢٦,٣٣ ٣٢ ٥٢٣ ٥٣٣ ٤٨٥,٧٥ ٥١٦ ٤٩١ Among residues rate= ٣١
	L.S.D. ٥٪	Among kinds of residues= Interaction= ٦٩	Among kinds of residues= Interaction= ٧٤
		Among concentrations= ٤٤ Interaction= ٩٨	Among residues rate = N.S Interaction= ٦٣

*** without control**

Table.5. Percent reduction in dry weight of wheat and barley due to treatment with residues extracts and whole residues of rice.

Test Crop	Rice Residues	(%)Reduction in dry weight						
		Extract conc.				Residues rate (g/ kg soil)		
		١٪	٢٪	٤٪	mean	١٠	٢٠	٤٠
								mean
Wheat	Ground straw		٣٢,٢	٣٤,٠	٣٨,١	٣٥,٥	٣٥,٣	٣٧,٦
					٣٤,٧٦	٣٦,١٣		٤٠,١
	Ground root		٣٧,٥	٣٧,٥	٤٠,٢	٤٢,٩	٤٦,١	٤٣,٠٣
					٣٨,٤٠	٣٣,٨	٣٠,٥	٣٠,٧
	Burned straw		٣٠,٩	٢٨,٤	٣٢,١			٣١,٦٦
	Burned root				٣٠,٤٦	٣٣,٨	٣٥,١	٣٨,٢
	mean		٢٨,٥	٢٨,٩	٢٩,٦			٣٥,٧٠
					٢٩,٠٠	٣٥,٨	٣٥,٩٥	٣٨,١٥
Barley			٣٢,٣٧	٣٢,٢	٣٥,٠٠			
	L.S.D. ٥٪	Among kinds of residues= ٤,٠				Among kinds of residues=٣,٨		
		Among concentrations= ٢,٤				Among residues rate= ٢,٢		
		Interaction= ٦,٤				Interaction= ٥,٧		
	Ground straw		٣٨,٨	٤٠,٤	٤٢,٥	٣٦,٦	٣٤,٤	٣٨,٢
					٤٠,٥٦			٣٦,٤٠
	Ground root		٤٠,١	٤٠,٠	٤٣,٤	٤٠,٤	٤٣,٣	٤٢,٦
					٤١,١٦			٤٢,١
	Burned straw		٣٢,٣	٣٣,٢	٣٦,٧	٣٠,١	٢٨,٥	٣٠,٦
	Burned root				٣٤,٠٦			٢٩,٧٣
	mean		٣٤,٤	٣٣,٤	٣٦,٦	٣٨,٥	٣٨,١	٤٠,٢
					٣٤,٨٠			٣٨,٩٣
			٣٤,١٥	٣٦,٨٥	٣٩,٨٠	٣٦,٤٠	٣٦,٠٧	٣٧,٩٠
	L.S.D ٥٪	Among kinds of residues= ٤,٤				Among kinds of residues= ٥,٦		
		Among concentrations= ٢,٧				Among residues rate= N.S		
		Interaction= N.S				Interaction= N.S		

In table 6. injury to leaf cells due to the effect of different sources of rice extracts and whole residues was evident. Injury was twice as much as that for control treatment for both crops. It seemed that the different kinds of residues extracts did not differ from each other significantly in causing injury in most cases. As concentration of the extract increases, injury increase also. Increasing residues rate cause no significant increase in injury in wheat but had a significant effect in increasing injury in barley. For interaction, burned straw extract at 4% and burned root of whole residues at 40g/kg soil were the most injurious to wheat leaf. In barley, ground root extract at 4% and ground root of whole residues at 40g/kg soil were the most effective in causing injury.

Cellular membrane are known to be the locus of injury. Losing plasma membrane integrity leading to disrupt membrane-associated functions. Electrolyte leakage is the most widely used method to asses injury (Levitt, 1980; and Ingram, 1985) . The results shown here indicated an increase in injury associated with changes in other parameters studied. Einhelling, 1995(b) mentioned that the reduction in growth was due to the effect on plasma membrane. Black, 1985 noticed that ion imbalance caused by the allelopathic effect ,due to changes in cellular membrane permeability, may in turn cause growth reduction .

	L.S.D. ٥٪	Among kinds of residues= ٥,٦ Among concentrations=٤,٥ Interaction= ٤,٥			Among kinds of residues= ٤,٨ Among residues rate= N.S Interaction= ٣,٨		
Test Crop		Rice Residues			Injury (%)		
	Control	١٤,٤	١٥,٦	١٥,٤	١٤,٤	١٢,٤	١٣,٥٠
	Ground straw			١٥,٣٣			
		Extract conc.			Residues rate (g/ kg soil)		
	Ground root	٢٠,٢١٪	٢٤,٤٪	٢٦,٩٪	٢٢,٢٠	٢٤,٦٠	٢٦,٨٥
	Burned straw			٢٣,٧٣			٢٤,٣٥
	Burned root			mean			mean
Wheat	Control	٢١٥٢,٦٠	٢٤,٢	٣٣,٤	٢٤,٤	٢١٤١,٣١	٢٨,٧
	Ground straw			٢٣,٤٦		١٠,٦٦	٢٥,٦٠
	Ground root	٣٢١٣,٣٠	٢٥,٨	٣٨,٣	١٣٧٠,,٢١	٢٤,٤	٢٦,٢
	Burned straw			٢٦,٣٣	١٨,٥٣		٢٣,٩٦٣
	Burned root	١٢٩٤,٣٥	٢٢,٩	٣٦,٩	٣٠٢,٦٥	٢٣,٤٠٧	٢٢٤١,٤
	mean*	٢٢,٩٠	٢١,٥٧	٢٤,٤٣	٢٢,٥	٢٣,١	٢٢,٠٧٦
		٢٤,٥	٢٦,٥	٢٣,٦٨	٣١,٨٣	٢٣,٩٠	٢٦,٣٧
Barley	L.S.D ٥٪	Among kinds of residues= ٣,٤ ٢٢,٢ ٢٧,٦ ٣٣,٤ Among concentrations=٣,٩ ٢٣,٥٥ Interaction= ٦,٨			Among kinds of residues= ٢,٦ ٢٠,٨٢ ٢١,٧٢ ٢٩,٦ Among residues rate= ٢,٢ Interaction= ٦,٣		

Table.6. Effect of residues extracts and whole residues of rice on injury to leaves of wheat and barley.

*** without control**

Previous studies indicated that leaving crops residues in the field, using no tillage cropping system, causing an increase in the allelochemicals effect on the subsequent crops. Putman (1983) found that leaving sorghum residues in the field after harvesting cause a substantial reduction in weeds accompany the next crop in the crop rotation. Thus, removing or burning residues should remove their effect. That was clear in the current study which indicats that burning residues resulted in diminishing the harmful effect especially in the case of reducing dry weight which was the most pronounced result.

In conclusion, adding rice residues; water extracts or whole residues, to wheat and barley result in seedling growth inhibition. Burned residues had less effect compare to non-burned residues

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مجلة البصرة للعلوم الزراعية ، المجلد ١٩ ، العدد ١ ، ٢٠٠٦

تأثير مخلفات الرز في انبات ونمو بادرات الحنطة(*Triticum aestivum* cv.IPA) والشعير (*Hordeum vulgare* cv. Local)

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الخلاصة

درس تأثير مصادر مختلفة لمخلفات الرز والتي تمثلت فى: القش , جذورجافة , قش محروق , وجذور محروقة في انبات البذور ونمو بادرات الحنطة(*Triticum aestivum* cv.IPA) والشعير(*Hordeum vulgare* cv.Local). استخدمت مستخلصات مائية للمخلفات المذكورة بتراكيز ٢،١,و ٤%. كذلك استخدمت كامل المخلفات بتراكيز ٢٠،١٠,و٤٠ غم/كغم تربة. تم قياس نسبة الانبات, طول المجموع الخضري والجذري, نسبة الاختزال في الوزن الجاف, كمية الكلوروفيل

في الاوراق, وكمية المواد الالكتروليتية الناضحة من خلايا الاوراق. بينت النتائج انه بزيادة تركيز المستخلص او كامل المخلف المستخدم فأن جميع مؤشرات النمو المدروسة قد قلت في كلا المحصولين عدا المواد الناضحة من اوراق البادرات حيث زادت نسبة الضرر الذي تسببه مع زيادة التركيز المستخدم. وكان استخدام الجذور المطحونة كاملة او استخدام مستخلصها هو الاكثر تأثيرفي خفض نسبة الانبات,طول المجموع الخضري والجذري,كمية الكلوروفيل والوزن الجاف. أما استخدام كامل المخلف فقد كانت الجذور المحروقة ذات فاعلية في زيادة الضررلآوراق بادرات الحنطة بينما استخدام الجذور المطحونة كان أكثر ضررا لآوراق الشعير. اما عن تاثير التداخل فقد كانت الجذور المطحونة المضافة على هيئة مستخلص بتركيز ٤% او المضافة بشكل مسحوق بتركيز ٤٠غم لكل كيلوغرام تربة هما الاكثر تثبيطا لمؤشرات النمو المدروسة .