



Effect of adding residues of *Trigonella foenum graecum L.* to the soil on the growth and chemical content of wheat (*Triticum aestivum L.*)

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ABSTRACT

The present study was conducted in the wired house for testing allelopathic ability of the Fenugreek plant residues taken from two stages of growth on some indicators of growth and chemical content of two cultivars of wheat. The analytic statistics of the results explained that adding residues of shoot to the soil led to get stimulus in relative water content, decrease in the low injury index and led to increase in the concentration of Na, N, while adding root residues led to increase in proline content and low injury index while there was decrease in K concentration as a result of adding shoot and root residues. The results showed that there was an increase in the concentration of N-Ca-Na-K in shoot system of the wheat compared with the concentration of these elements in root system. The early age stage (seedling stage) showed significant increase in the concentration of N-Ca-Na-K and chlorophyll and proline and low injury index compared with mature stage. On other hand no significant differences were observed between cultivars (Al-Ize and Talafar-3) in chemical content but there was a superiority of Al-Ize cultivar in some of its growth parameters.

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KEYWORDS

Allelopathy;
Fenugreek;
Wheat.

INTRODUCTION

Allelopathy is defined as the direct or indirect harmful or beneficial effects of one plant on another through the production of chemical compounds, that escape into the environment^[1]. The release of chemical compounds can be as the four different processes: volatilization, decomposition, leaching and root exudation^[2]. It was that the founded the inhibition growth, or stimulation in the presence of allelochemicals compounds depends on the age and stage of decomposition and concentration of allelochemicals compounds and the type of crop grown^[3].

The study of^[4] document that decrease in the relative water content the total chlorophyll and the stability of cell membrane in leaves of two wheat cultivars grown in soils containing power of leaves of *Beta vulgar*.

The study of^[5] found also decrease in the relative water content and total chlorophyll in the two wheat cultivars grown in soil added residues of *Foeniculum vulgar* and *Medicago sativa*. While^[6] reported the effect of sunflower residues on the growth of two cultivars of wheat, where he noted that cultivar margall 99 more resistant and well tolerate of allelochemicals and these compound affect in the absorption of nutrients.^[7] studied the allelopathic effect of aqueous extracts of

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fenugreek seeds the growth of two wheat cultivars, the results showed stimulated effect in the relative water content, total chlorophyll, and elements content of plant (Na, K, Ca, Mg) compared with plants in control group. In an experiment in the green house^[8] indicated that the addition of different concentrations of *Anethum graveolens* L residues led to significant increase of N, proline, P, Fe, K⁺ and Na⁻ content of two types of Barley. Fenugreek plant of family fabaceae are important for food source of protein as well as improvement of soil physical and chemical proteins. The aim of this study was to assess the allelopathic effect of two growth stages of fenugreek residues on some growth parameters and chemical components of two wheat cultivars.

MATERIAL AND METHODS

The soil was brought from the Sada and Bauazh in Nineveh Governorate, an agricultural region of the depth (0-30) cm, the soil was dried and passed through 2 mm sieve. The analysis of the soil was made and texture was a loamy sand. The field capacity was 27%. The Fenugreek was taken from Talisqif / Tilkaif. They were during two stages of growth the first phase (seedling stage) and the second phase (mature stage). The plants were washed well and separate the shoot form root and dried an aerobically and cut into pieces and milled by electric grinder and preserved in plastic caus. Then experiment was applied in the wired house with addition 3g / 100g soil in pots plastic capacity 4kg and added each pot liter of water and block nozzles anvils cover nylon perforated and left randomly for a period of incubation for three weeks were planted two cultivar of wheat (Talafar-3-, Al-Ize). In 19/12/2012 were obtained seeds from Department of examination and certification of seeds for the Northern district / Nineveh with 15 seeds in each pot at 1 cm depth and three weeks after seedling was reduced to 6 seedling for each pot. Normal water was used and the moisture level of the soil 75% of field capacity through the weighing of the pots daily, after 60 days of planting, some indicators of growth were studied and a study of the chemical content of the shoot, root of the two wheat cultivars

Growth parameters

- 1 Relative water content according to^[9].
- 2 Chlorophyll content in leaves extracts and determined at 633-645nm by spectrophotometer ac-

ording to^[10].

- 3 Proline according to^[11].
- 4 Cell membranestability: according to^[12] and membrane injury was evaluated as the percentage injury index formula^[13].

Determination of chemical content in wheat plants

The dried plant samples of root and shoot wheat, were milled electrically and 0.5gm was taken out from each sample and was digested according to^[14].

The following elements were estimated in the root and shoot of wheat:

- 1 Nitrogen: by using micro-kjeldal method^[15].
- 2 Calcium and Magnesium: by Filtration with EDTA^[16].
- 3 Potassium and Sodium: by using flame photometer^[17].

The experiments were designed as factorial experiment in Completely Randomized Design (C. R. D) with three replications. The average, were compared by Duncan's multiple range tests at 0.05 probability level for all comparisons.

RESULTS

Relative water content

The results in TABLE 1 showed significant increase of Talafar-3- cultivar over Al-Ize cultivar which reached to 6.92%. The effect of residues used, has stimulate in the treatment of root and shoot compared with control treatment the percentage of excellence were 6.59%, 12.9% respectively concerning the influence of growth stage, has received a significant reduction in the seedling stage compared with mature stage. However interaction between cultivars and residues there were significant increase for the treatment of root for cultivar Talafar-3- compared with all treatments. While effect of the interaction between cultivars and residues and growth stage there was highest percentage of the root in mature stage cultivar Talafar-3-.

Total of chlorophyll

Results of TABLE 2 indicated, significant increase of Al-Ize cultivar over Talafar-3- cultivar, in ratio of 21.8%. on other hand the effect of residues used, the impact of residues, has got excellence in control treatment compared with shoot and root treatment. In regard the effect of age stages. There was reduction in

TABLE 1 : Effect of fenugreek residues on two growth stages in relative water content (%) of the two wheat cultivars

Cultivars	Fenugreek residues	Seedling stage	Mature Stage	Cultivars × Residues	Cultivars	Residues
Al-Ize	Control	65.86e	65.86e	65.86c		
	Shoot	70.56de	82.60ab	76.58b		
	Root	75.36bcd	73.96cd	74.66b		
Talafar-3-	Control	74.73cd	74.73cd	74.73b		
	Shoot	66.16e	80.50abc	73.33b		
	Root	81.50abc	87.03a	84.11a		
Cultivars × Growth stage	Al-Ize	70.61b	74.15b		72.38b	
	Talafar-3-	74.03b	80.75a		77.39a	
Residues × Growth stage	Control	70.31b	70.31b			70.31c
	Shoot	68,36b	81.55a			74.95b
	Root	78.28a	80.50a			79.39a
Growth stage		72.45b	77.45a			

Means following difference letters are significant at p=0.05 based Duncan’s multiple range test

maturity stage reached 18.6 compared with seedling stage. Concerning the interaction effect between (residues and growth stage) we have noted the excellence of Al-Ize cultivar over all other treatments. In respect to the interaction between (residues and growth stage), there was reduction in the shoot treatment during mature stage and there has been an increase in the same treatment in seedling stage. While interaction of three factors (cultivar × residues × growth stages) the highest growth was for the treatment of cultivar Al-Ize, among the shoot residues during the seedling stage.

Proline content

The results of the TABLE 3 showed significant differences between the two cultivars, hence Al-Ize cultivar

has superiority over Talafar-3- in percent of 25.2%. Concerning the effect of residues, an increase was noted in shoot residues as 56.9% compared with control treatment. As for the growth stage the seedling stage was superior to the mature stage by (58.5%). The effect interference between (cultivars and residues) a stimulus was made for Al-Ize cultivar in the treatment of root compared to all treatments. Relating to the interaction between (residues and growth stages) there was significant increase in the treatment of shoot stage on seedling stage. The impact of triple interaction gave highest treatment for Al-Ize cultivar over the shoot at seedling stage.

Injury index for cell membranes

TABLE 4 showed that Al-Ize cultivar showed a

TABLE 2 : Effect of fenugreek residues, on two growth stages in total chlorophyll (mg/g) of the two wheat cultivars.

Cultivars	Fenugreek residues	Seedling stage	Mature Stage	Cultivars × Residues	Cultivars	Residues
Al-Ize	Control	2.41b	2.41b	2.41a		
	Shoot	3.10a	1.42cd	2.26ab		
	Root	2.11b	2.28b	2.20ab		
Talafar-3-	Control	2.08b	2.08b	2.08ab		
	Shoot	2.24b	1.06d	1.65c		
	Root	1.83bc	1.97bc	1.90bc		
Cultivars × Growth stage	Al-Ize	2.54a	2.04b		2.29a	
	Talafar-3-	2.05b	1.71c		1.88b	
Residues × Growth stage	Control	2.15b	2.15b			2.25a
	Shoot	2.67a	1.24c			2.05ab
	Root	1.97b	2.13b			1.95b
Growth stage		2.30a	1.87b			

Means following difference letters are significant at p=0.05 based Duncan’s multiple range test

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TABLE 3 : Effect Fenugreek residues on two growth stages in proline (μ mol/ gm) of the two wheat cultivars

Cultivars	Fenugreek residues	Seedling stage	Mature Stage	Cultivars \times Residues	Cultivars	Residues
Al-Ize	Control	5.55bc	5.55bc	5.55a		
	Shoot	10.46a	2.15d	6.30a		
	Root	2.28d	1.69d	1.99c		
Talafer-3-	Control	1.83d	1.83d	1.83c		
	Shoot	6.38b	4.19c	5.28a		
	Root	5.84cd	2.02d	3.93b		
Cultivars \times Growth stage	Al-Ize	6.10a	3.13c		4.61a	
	Talafer-3-	4.68b	2.68c		3.68b	
Residues \times Growth stage	Control	3.69b	3.69b			3.69b
	Shoot	8.42a	3.17b			5.79a
	Root	4.06b	1.84c			2.96b
Growth stage		5.39a	2.90b			

Means following difference letters are significant at $p=0.05$ based Duncan's multiple range test

good results over the Talafer-3- cultivar in percent of 5.4%. Regarding the effect of residues there was a reduction in the injury index more than in the shoot or root residues compared with control treatment. The impact of growth stages show significant increase of seedling stage over mature stage by 12.0% and with respect to the effect of interaction between (cultivars \times residues) there has been reduction in the treatment of root for the cultivar of Talafer-3- compared to the other of treatments. The impact of interaction between (cultivars \times growth stages) showed a good results for two cultivar with seedling stage. According to the triple interactions was noted a highest treatment for cultivar Al-Ize shoot in mature stage. But there was less treatment for the same cultivar in the treatment of root and

seedling stage.

Nitrogen

It is clear from the TABLE 5 that there is no significant difference between Al-Ize and Talafer-3- cultivars. The effect of residues used showe dan increase as a result of adding residues of shoot by 4.6% compared with the treatment of control and there was no significant difference in the concentration of the element in the total shoot and root of wheat. Concerning the residues of growth stages, it is noted that the seedling stage have over excellence mature stage at a rate of 9%. The interaction between cultivars and growth stages may exceed the cultivar Al-Ize in the seedling stage compared with other treatment the same result has been got

TABLE 4 : Effect of fenugreek residues on two growth stages in injury index (μ s) of the two wheat cultivars

Cultivars	Fenugreek residues	Seedling stage	Mature Stage	Cultivars \times Residues	Cultivars	Residues
Al-Ize	Control	76.60a	76.60a	76.60a		
	Shoot	56.35ef	78.54a	69.92b		
	Root	54.20f	62.07de	68.55b		
Talafer-3-	Control	74.61a	74.61a	74.61a		
	Shoot	62.02de	77.82a	67.44b		
	Root	67.07cd	69.64c	58.14c		
Cultivars \times Growth stage	Al-Ize	74.30a	67.75b		71.03a	
	Talafer-3-	72.00a	62.78c		67.39b	
Residues \times Growth stage	Control	75.61a	75.61a			75.61a
	Shoot	59.18c	78.18a			68.68b
	Root	60.83c	65.86b			63.34c
Growth stage		73.15a	65.27b			

Means following difference letters are significant at $p=0.05$ based Duncan's multiple range test

due to interactions with the growth stages. The interaction of the three factors (cultivars × residues × growth stages), Talafar-3- had its superiority over the residues of shoot in the shoot concentration compared with other treatment. Regarding to interaction of the four factors the same results has been got the triple interaction during the early age stage.

to the interaction between the growth stages and element concentration. The interaction of four factors, made Al-Ize excellent over others when fenugreek residues have been added during the two growth stages at concentration the element in shoot system of the wheat compared with other treatment.

TABLE 5 : Effect of fenugreek residues on two growth stages in nitrogen concentration (%) root and shoot system of the two wheat cultivars

Cultivars	Fenugreek residues	Element concentration wheat	Growth stage		Cultivars × Residues × concentration	Cultivars Residues	Element concentration
			Seedling stage	Mature Stage			
Al-Ize	Control	Shoot	2.360bc	2.360 bc	2.360 ab		
		Root	2.190cd	2.190cd	2.190 bcd		
	Shoot	Shoot	2.610b	1.7330 e	2.17 bcd		
		Root	2.270cbd	2.150 cd	2.21 bc		
	Root	Shoot	2.160 cd	2.130 cd	2.145 bcd		
		Root	2.150 cd	2.033cde	2.091 bcd		
Talafar-3-	Control	Shoot	1.930 de	1.930 de	1.930 d		
		Root	2.030cde	2.030 cd	2.030 cd		
	Shoot	Shoot	3.060 de	1.920 de	2.49 a		
		Root	2.240bcd	2.180 cd	2.21 bc		
	Root	Shoot	1.920de	1.990cde	1.955 cd		
		Root	2.110cde	2.150 cd	2.130 bcd		
Cultivars × growth stage	Al-Ize		2.29 a	2.098 bc		2.194 a	
	Talafar-3-		2.215 ab	2.033 c		2.124 a	
Residues × growth stage	Control		2.127 b	2.127 b		2.127 b	
	Shoot		2.545 a	1.995 b		2.27 a	
	Root		2.085 b	2.075 c		2.080 b	
Growth stage × Concentration	Shoot		2.340 a	2.010 c			2.175 a
	Root		2.165 b	2.122 bc			2.143 a
Growth stage			2.252 a	2.066 b			

Means following difference letters are significant at p=0.05 based Duncan’s multiple range test

Calcium

The statistical analysis of TABLE 6 showed no significant difference between cultivars. Relating to the impact of the residues, there was significant difference due to the of addition of rootresid ues compared with control treatment while shoot residues did not showed those differences. In regard to the concentrations impact, there was an increase in the concentration of the element in shoot system of the plant by (26.6%) comparing with its concentration in the root system of the wheat. The impact of growth stage led to improved in seedling stage on mature stage by (31.4). While there was a reduction in root residues at mature stage comparing with other three treatments due to the interaction if the age stage and residues, but there was stimulus in the concentration of shoot system in seedling stage due

Magnesium

TABLE 7 shows no any significant differences between the cultivars of wheat used as well as there were no significant difference an result of adding shoot residues and root and got the same results in the concentration element in root and shoot system, but there was an increase which did not reach significant in the seedling stage compared with mature stage and there have been no get differences (p ≤ 0.05) due to interaction of the three and the four factors of used treatments.

Potassium

The results in TABLE 8 show that there were no significant differences between cultivars of wheat while reduction was shown due to the effect root and shoot residues compared with the control treatment, but there

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TABLE 6 : Effect of fenugreek residues on two growth stages in calcium concentration (%) of root and shoot system of the two wheat cultivars

Cultivars	Fenugreek residues	Element concentration wheat	Growth stage		Cultivars × Residues × Concentration	Element concentration
			Seedling stage	Mature Stage		
Al-Ize	Control	Shoot	0.550 a	0.550 a	0.550 a	
		Root	0.318 bc	0.318 bc	0.318 a	
	Shoot	Shoot	0.542 ab	0.200 c	0.371 c	
		Root	0.492 ab	0.234 c	0.363 c	
	Root	Shoot	0.464 ab	0.356 abc	0.410 abc	
		Root	0.393abc	0.383 abc	0.388 bc	
Talafar-3-	Control	Shoot	0.528 ab	0.528 ab	0.528 ab	
		Root	0.340 abc	0.342 abc	0.340 c	
	Shoot	Shoot	0.507 ab	0.187 c	0.347 c	
		Root	0.367 abc	0.217 c	0.292 c	
	Root	Shoot	0.413 abc	0.317 bc	0.365 c	
		Root	0.313 bc	0.347 abc	0.330 c	
Cultivars × Growth stage	Al-Ize		0.459 a	0.340 bc		0.400 a
	Talafar-3-		0.411 ab	0.322 c		0.367 a
Residues × Growth stage	Control		0.434 ab	0.434 ab		0.434 a
	Shoot		0.477 a	0.209 c		0.343 b
	Root		0.395 ab	0.350 b		0.373 ab
Growth stage × Concentration	Shoot		0.500 a	0.356 b		0.428 a
	Root		0.370 b	0.306 b		0.338 b
Growth stage			0.435 a	0.331 b		

Means following difference letters are significant at $p = 0.05$ based Duncan's multiple range test

was stimulus in the concentration of the element in shoot system by (142.5%) as a compared with concentration in the root system, and also obtained significant increase in the growth stages by (17.3%) compared with mature stage. Regard to the interaction between the age and concentration of the element it was noted that there been an increase in residues shoot of the seedling stage comparing with the other treatment. With the respect to the all treatments, Talafar-3- cultivar showed superiority when adding residues shoot in seedling stage and in the element concentration in the shoot system comparing to the twenty three treatments.

Sodium

The results in the TABLE 9 showed that there were no significant differences between the cultivars, but an significant increase due to adding shoot and root residues of plant was noted by (31.2, 20.9%), respectively, compared with the control treatment and there was reduction in the concentration of root system by

(67.7%) comparing with treatment of shoot system. Regarding the impact of the age the mature age, the seedling stage has excellence over the mature stage by (8.9%). The residues root treatment in the seedling stage has was superior comparing with other treatments that was shown though the interaction between the age stage and residues. Concerning the impact of concentration there was an increase in the element concentration during the growth stage and the shoot system comparing with the element concentration in the root system. Regarding to the triple interactions between cultivars, residues and concentration, Talafar-3- was superior after adding shoot residues to the shoot concentration comparing with other treatments.

DISCUSSION

With checking the results of the impact of residues of fenugreek plant in the chemical contents was found a stimulus due to adding shoot residues in the nitrogen

TABLE 7 : Effect of fenugreek residues on two growth stage in magnesium concentration (%) of root and shoot system of the two wheat cultivars

Cultivars	Fenugreek residues	Element concentration wheat	Growth stage		Cultivars × Residues × concentration	Cultivars Residues	Element concentration
			Seedling stage	Mature Stage			
Al-Ize	Control	Shoot	0.222 a	0.222 a	0.222 a		
		Root	0.224 a	0.224 a	0.224 a		
	Shoot	Shoot	0.286 a	0.223 a	0.254 a		
		Root	0.253 a	0.174 a	0.213 a		
	Root	Shoot	0.246 a	0.223 a	0.234 a		
		Root	0.299 a	0.232 a	0.265 a		
Talafar-3-	Control	Shoot	0.206 a	0.206 a	0.206 a		
		Root	0.296 a	0.296 a	0.296 a		
	Shoot	Shoot	0.250 a	0.180 a	0.215 a		
		Root	0.288 a	0.213 a	0.250 a		
	Root	Shoot	0.256 a	0.191 a	0.223 a		
		Root	0.220 a	0.288 a	0.254 a		
Cultivars × Growth stage	Al-Ize		0.255 a	0.216 a		0.235 a	
	Talafar-3-		0.252 a	0.229 a		0.240 a	
Residues × Growth stage	Control		0.237 a	0.237 a		0.237 a	
	Shoot		0.269 a	0.197 a		0.233 a	
	Root		0.255 a	0.233a		0.244 a	
Growth stage × Concentration	Shoot		0.244 a	0.207 a			0.250 a
	Root		0.263 a	0.237 a			0.225 a
Growth stage			0.253 a	0.222			

Means following difference letters are significant at $p = 0.05$ based Duncan's multiple range test

TABLE 8 : Effect of fenugreek residues on two growth stage in potassium concentration (%) for root and shoot system of the two wheat cultivars

Cultivars	Fenugreek residues	Element concentration wheat	Growth stage		Cultivars × Residues × concentration	Cultivar Residues	Element concentration
			Seedling stage	Mature Stage			
Al-Ize	Control	Shoot	3.040 bcd	3.040 bcd	3.040 b		
		Root	1.006 h	1.006 h	1.006 d		
	Shoot	Shoot	3.320 b	2.740 de	3.030 b		
		Root	1.346 hf	1.086 h	1.216 d		
	Root	Shoot	3.210 bc	2.333 f	2.771 b		
		Root	1.260 h	1.170 h	1.215 d		
Talafar-3-	Control	Shoot	3.353 b	3.353 b	3.353 a		
		Root	1.225 h	1.225 h	1.225 d		
	Shoot	Shoot	3.850 a	1.683 g	2.766 b		
		Root	1.226 h	1.036 h	1.131 d		
	Root	Shoot	2.083 f	2.393 ef	2.238 c		
		Root	1.190 h	1.143 h	1.166 d		
Cultivars × Growth stage	Al-Ize		2.197 a	1.901 b		2.049 a	
	Talafar-3-		2.164 a	1.805 a		1.984 a	
Residues × Growth stage	Control		2.156 b	2.156 b		2.156 a	
	Shoot		2.435 a	1.636 d		2.035 b	
	Root		1.935 c	1.759 d		1.847 c	
Growth stage × Concentration	Shoot		3.142 a	2.563 b			2.852 a
	Root		1.208 c	1.144 c			1.176 b
Growth stage			2.175 a	1.853 b			

Means following difference letters are significant at $p=0.05$ based Duncan's multiple range test

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TABLE 9 : Effect of fenugreek residues on two growth stages in sodium concentration (%) of root and shoot system of the two wheat cultivars

Cultivars	Fenugreek residues	Element concentration wheat	Growth stage		Cultivars × Residues × Concentration	Element concentration
			Seedling stage	Mature Stage		
Al-Ize	Control	Shoot	1.300 e	1.300 e	1.300 c	
		Root	0.463 f	0.463 f	0.463 d	
	Shoot	Shoot	2.396 a	1.510 de	1.953 a	
		Root	0.560 f	0.156 f	0.538 d	
	Root	Shoot	1.556 de	2.020 bc	1.788 ab	
		Root	0.593 f	0.472 f	0.532 d	
Talafar-3-	Control	Shoot	1.320 e	1.320 e	1.320 c	
		Root	0.560 f	0.560 f	0.560 d	
	Shoot	Shoot	2.160 ab	1.373 e	1.766 a	
		Root	0.600 f	0.486 f	0.543 d	
	Root	Shoot	1.366 e	1.810 cd	1.588 b	
		Root	0.513 f	0.483 f	0.498 d	
Cultivars × Growth stage	Al-Ize		1.144 a	1.046 a		1.095 a
	Talafar-3-		1.086 a	1.005 a		1.045 a
Residues × Growth stage	Control		0.910 c	0.910 c		0.910 b
	Shoot		1.429 a	0.971 c		1.200 a
	Root		1.007 c	1.196 b		1.101 a
Growth stage × Concentration	Shoot		1.683 a	1.555 a		1.619 a
	Root		0.548 b	0.496 b		0.522 b
Growth stage			2.252 a	2.066 b		

Means following difference letters are significant at $p=0.05$ based Duncan's multiple range test

and an increase in the sodium concentration also due to the addition of shoot and root residues while there was inhibition in the potassium concentration as a result of adding shoot and root residues. The contrast between the stimulation and the inhibition explained two facts. First inhibition and the stimulation for nutrient absorption depend on the residues source and specifications in the soil. Second the availability of the elements. The results of the study accord with the^[17] which says that adding the corn extracts led the corn plant reduce the nitrogen, phosphorus, magnesium, zinc as well as led to stimulate take potassium and magnesium.^[18] explained that adding plant residues to the soil makes changes in the physical and chemical properties of soil and the PH of it which indirectly affect the elements absorption or availability by the grown plants in the soil. The reduction happened in the potassium concentration correspond with^[19] form reduce in potassium concentration in the barely plants that is in the soil containing residues of wheat, corn and rape, and with results^[20] which showed that the soil treated by wheat residues led to reduction in the potassium concentration in the wheat. This reduction goes the allelopathic compounds liberal than those soils, these residues in the absorption of the

elements from these compounds have effect on the permeability of membranes, this accords with^[21] of the allelopathic compounds have its effect on the permeability of membranes by inhibiting enzyme ATPase or reduce energy content ATP.

Adding shoot and root residues led stimulation in the relative water content as well as stimulation in the proline concentration that was due to adding the shoot residues with reduce in the injury index, the increase got in those properties is important to the plant growth, this accords with^[22] mentioning that the ability of the plant to accumulate proline has its own adaptive plant importance because this acid contributes in reducing osmotic potential of the cell and keeps the water move gradually into the cell. This increase also led to an increase water content relative (TABLE 1) due to the plant residues addition.

Concerning the age stage effects, there was stimulation in the plant chemical content (K- Mg- Ca- N) as well as in the growth parameters such as the concentration of chlorophyll and proline and cell membrane stability during the early stage compared with the mature stage, that variation may be due to the difference in the quantity and quality of allelopathic compounds which

are in the plant parts that determines its contrastive effect in the other corps whether it was a stimulation or inhibition. The stimulation in the early stage and inhibition in the late stage accords with^[23] results, the corn residues have difference allelopathic effects during the growth season and the residues taken in April, August, September inhibited the corn growth, while the residues taken in other months stimulation its growth.^[24] reported that plant aged increase amount of material stored and increased negative effect in the germination and growth parameters of receptor plant.^[25] indicated that cereal crop content increase the elements content in the first weeks, this is due to the relative increase in the rate of absorption of nutrients compared to the absolute growth rate. When checking the chemical content, the results showed increase in the elements concentrations (N-Ca-Na-K) in the shoot system of wheat with the concentration of the some elements in the root system, this leads us to a result that the chemical content varies according to the different parts of the plant this conclusion accords with^[20] reporting that treating the soil with the wheat residues affected the concentration of some elements in the shoot and root as well as the grains got decrease in the concentration of nitrogen and potassium concentration in the shoot system and phosphorous in the root system, while the concentration of phosphorous, potassium and the calcium increased in shoot system referring to study^[26] that allelopathic effect in content chemical of soy bean noticed that there were accumulation of Magnesium, Calcium, Zinc ions in the shoot system while the ions of zinc and iron were more in the root system. The results^[27] pointed that the ability of absorption by the plant and its ability to collect the minerals during the growth stage is affected by many factors most of them are due to allelopathic effects. The results show that there are no significant differences in the chemical content of two wheat cultivars but the results of the interactions between factors showed the superiority of Al-Ize over the Talafar-3- in many traits because of the interaction of the cultivar with the age or the residues or the concentration. The results of the growth parameters asserted that there is superiority for the Al-Ize and it is necessary to choose the cultivars that have allelopathic effect rather than the cultivars that showed sensitivity to those compounds.

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