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The allelopathic effect of different species of grapevine berries aqueous extracts on some germination parameters of lettuce (*Lactuca sativa* L.) seeds.

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Abstract

Allelopathic potential of twelve local varieties of grapevine *Vitis vinifera* fruits: taefi; zareg-dohuok; Baetmuni; Black-manga; Sarqala-bakrajo; Awelka; Rash-merii; Mala-Hassan; Ashgar-basraha; Kamalii; Toli-mawelian and Shekh-nuraddin on some germination and growth parameters of lettuce seeds *Lactuca sativa* has been investigated . The aqueous extracts caused significant inhibitory effects on germination rate; germination speed; radical length; plumule length; radical, plumule and total seedlings dry weight. Bioassays indicated that the inhibitory effects were increased with increasing the aqueous extracts concentration. These results indicated that there is a considerable variation of allelopathic activity that could be utilized in the field of controlling weed plants.

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Introduction

Grapevine *Vitis vinifera* is a deciduous woody tree which its fruits can be eaten raw or used for jam, juice, jelly, vinegar, raisins...etc. it is one of the most important fruit species due to its different uses according to the oldest record belongs to 3500-2900 years B.c. it was originated in southern turkey an area that is called Anatolia (Gokbayrak and Soylemezoglu, 2010). United Nations FAO statistical data indicated that 75.866 Km² of land are grapevine, from this area 71% is used for wine, while only 27% is used as fresh fruit and only 2% is used for drying (raisins), in iraq the area of grapevine or vineyards grow gradually as official statistical data declares that about 84000 hectare with yearly production of 265000 ton that concentrated in the rural mountain area of iraqi Kurdistan (FAO, 2007) and (FAO, 2003).

The phytochemistry of grapevine has been intensively studied and the numbers of identified compounds were exponentially increased with the development of analytical chemistry techniques, where today more than 500 compounds have been identified (Ali *et al.,* 2010), in general these compounds were considered as plants secondary metabolites which have diverse chemical structures and known to play an important role in different plants biological processes (Vining, 1990). Allelopathy, the biological phenomenon that defined as the beneficial or harmful biochemical interaction between plants (Ali, 2001, and Rice 1984), it is well known that the key factor of these biochemical interactions is chemicals that known as allelochemicals (Einhilling, 1995) most of these allelochemicals are plants secondary metabolites due to the reason that these compounds were formed throughout main metabolic pathways of carbohydrates, fats, and amino acids (Macias, 2005). In spite of the large number of allelopathic studies on different plant species, we did not find any papers on the allelopathic potentiality of grapevine fruits (berries). The objective of this study was investigating the allelopathic effect of different local varieties on some germination and growth parameters of lettuce (***Lactuca sativa* L.**) seeds that used as bioassay target species in this study to estimate the allelopathic potentiality of these fruits as an allelopathic source that might be used for controlling different agricultural pests especially weed plants (Inderjit and Dakshini, 1995).

Materials and methods

Plant materials

Fruits (berries) of different varieties of grapevine (*Vitis vinifera* L.) were collected from local varieties such as Taefi; Zarig-dohouk; Baetmuni; Sarqala-bakrajo; Awelka; Rash-meri; Mala-Hassan; Ashgar-basraha; Kamalii; Toli-mawelian and Shek-nuraddin from the fields of Arbil agricultural research center that allocated about 3km from city-center of Erbil.

Grapevine fruits chemical analysis

Collected samples were randomly selected on the basis of absence of any physical or disease injury, then samples were subjected to some chemical analysis as total soluble solids by Erma refractometer with using pure-water as blank solution that has been left to stand for a period of time in room temperature then sending the boundary line to zero by using the adjusting screw knob for calibration (Hellman, 2004). Test for Alkaloid, poly phenolic compounds, carbohydrates, Tannins, Saponnins, and Glycosids were run on the fruit berries aqueous extracts (Bamandy, 2006), Poly phenolic compounds were estimated according to folin-ciocalteu reagent method (Pastrana-bonilla., 2003 and Butkhup *et al.,* 2010).

Preparation of grapevine fruits aqueous extracts

Grapevine fruits (berries) were placed in an electrical blinder then blended and filtered by Whatman#1filter paper after that samples were sterilized with bacterial filter (Millipore 0.45µ). The collecting extracts were stored in special dark plastic bottles prepared for such purposes and reserved in deepfreeze at -20°C for subsequent use (Wang *et al.,* 2011), after that different concentrations of the extracts (zero, 5%, 10%, and 15%

water) were prepared by adding distilled water to the fruit extracts with considering that zero concentration contains only distilled water that was used as control treatment.

Bioassay

Plant seeds that was chosen as an indicator for these study was Lettuce *Lactuca sativa* L. seeds. Twenty five seeds were placed between two sheets of filter paper #1 in 9 cm Petri-dishes then each petri-dish treated with 8ml of the studied concentrations of the grapevine berries extracts, after that petri-dishes were sealed and placed in growth chamber 20-25°C under humidity 75% and continuous darkness. The recording data were germination rate, inhibition of germination rate, speed of germination (seed/ day), radical length (cm), radical elongation velocity (cm/day), plumule length(cm), plumule elongation velocity (cm/day), radical dry weight(mg), plumule dry weight (mg), and seedling total dry weight (mg), radical and plumule growth inhibition rate the equations shown below (De-Oliveira *et al.*, 2008) (Ali and Aziz, 2002) (Norsworthy, 2003) and (Jian and Lafitte, 2007).

$$\text{Germination rate} = \frac{\text{germinated seeds}}{\text{total seeds number}} \times 100 \quad \text{(Eq. 1)}$$

$$\text{inhibition of germination \%} = \left(\frac{\text{Germination rate in control} - \text{Germination rate in treatment}}{\text{Germination rate in control}}\right) \times 100 \quad \text{(Eq. 2)}$$

$$\text{Speed of Germination} = \left(\frac{N1}{1} + \frac{N2}{2} + \frac{N3}{3} \ldots . \frac{N}{n}\right) \times 100 \quad \text{(Eq. 3)}$$

Where N1, N2, N3...N = proportion of seeds which germinate on days 1, 2, 3 ...n the following setup of equation.

After three days from incubating first data set were recorded the germination of seeds were recorded by considering the protruded radicals, while the radical or plumule elongation velocity were calculated according to the following equation:

$$\text{Radical or Plumule elongation Velocity} = \frac{\text{Radical or Plumule length (cm)}}{\text{Total number of days}} \quad \text{(Eq. 4)}$$

Radical or plumule dry weight were recorded by placing the samples in an electrical oven 40°c for 72 hours or until weight consistency to record the dry weight. Radical or plumule growth inhibition was calculated according to the equation by estimating the inhibition depending on the dry weight of radical or plumule.

$$\text{Radical or Plumule growth inhibition} = \left(1 - \left(\frac{\text{Value under stress}}{\text{value in nonstress conditions}}\right)\right) \times 100 \quad \text{(Eq. 5)}$$

Statistical analysis

The study consists of two factors; grapevine varieties, and extract concentrations with three replicates for each treatment, the analysis of variance for all data were performed using Statistical Package for the Social Sciences (SPSS version 18) and excel statistical programmer, while for mean comparisons duncan test was used (Weinberg and Abramowitz, 2008) and (Field, 2005).

Results and discussion

The effect of Grapevine varieties on the studies parameters

Results indicates significant differences between all studied parameters (P≥0.01) except radical and total seedling dry weights as shown in Table (1), where Baetmuni and Sarqala-Bakrajo recorded highest germination rate 96.667% comparing to Mala-Hassan variety that scored lowest germination rate 64.583 %. The inhibition of germination rate were opposite to was noticed for germination rate were Mala-Hassan expressed highest inhibition rate 34.417% and both varieties of Baetmuni and Sarqala-Bakrajo recorded only 3.333% inhibition of germination rate. The variety of Sarqala-Bakrajo has highest speed of germination when recorded 12.009 seed/ day and the variety of Shekh-nuraddin recorded the lowest speed of germination 6.245 seed/day. While parameters of radical length, radical elongation velocity, plumule length and plumule elongation velocity highest values were observed with the variety of Sarqala-bakrajo but the lowest values were associated with three varieties Taefi, Mala-Hassan and Toli-Mawelian.

Table 1. Effect of Grapevine variety on germination and some growth parameters of lettuce seeds.

Variety	Germination Rate	Inhibition Rate	Germination Speed (seed/day)	Radical length (cm)	Radical Speed of elongation (cm/day)	Plumule length (cm)	Plumule Speed of elongation (cm/day)
Taefi	77.083 c	22.917 c	8.960 d	0.820 d	0.103 d	0.623 d	0.078 c
Zareg-dohuok	84.583 b	15.417 d	7.399 e	1.088 c	0.137 c	0.720 cd	0.093 c
Baetmuni	96.667 a	3.333 e	10.654 c	1.929 b	0.242 b	1.092 b	0.160 b
Black Manga	92.083 a	7.917 e	11.051 bc	1.236 c	0.156 c	0.858 c	0.107 bc
Sarqala-Bakrajo	96.667 a	3.333 e	12.009 a	2.295 a	0.289 a	1.283 a	0.233 a
Awelka	93.750 a	6.250 e	9.572 d	1.733 b	0.218 b	1.117 b	0.137 bc
Rash merii	95.417 a	4.583 e	11.623 ab	1.303 c	0.164 c	0.822 c	0.103 bc
Mala Hassan	64.583 e	34.417 a	7.756 e	0.820 d	0.103 d	0.623 d	0.078 c
Ashgar Basraha	67.917 de	32.083 ab	9.622 d	1.160 c	0.146 c	0.802 c	0.100 bc
Kamalii	76.667 c	23.333 c	9.396 d	1.077 c	0.136 c	0.747 cd	0.093 c
Toli Mawelian	75.000 cd	25.000 bc	7.637 e	0.820 d	0.103 d	0.623 d	0.078 c
Shekh nuraddin	68.333 de	31.667 ab	6.245 f	1.220 c	0.153 c	0.822 c	0.103 bc

Common letter means that there was non-significant at 1% probability level by Duncan's test.

Table 2. The effect of Grapevine berries aqueous extracts concentration on some studied parameters.

Concentration	Germination Rate	Inhibition Rate	Germination Speed (seed/day)	Radical length (cm)	Radical Speed of elongation (cm/day)	Plumule length (cm)	Plumule Speed of elongation (cm/day)
control	100.00 a	0.000 c	13.663 a	3.280 a	0.413 a	2.493 a	0.312 a
5 %	85.139 b	14.861 b	9.106 b	1.135 b	0.143 b	0.523 b	0.097 b
10 %	80.9722 b	19.028 b	8.679 b	0.401 c	0.050 c	0.229 c	0.029 c
15 %	63.472 c	36.528 a	5.859 c	0.350 c	0.044 c	0.131 d	0.017 c

Common letter means that there was non-significant at 1% probability level by Duncan's test.

Aweilka variety has highest radical, plumule and total seedling dry weights 14.542mg, 9.767mg and 24.309mg respectively, meanwhile the three varieties of Taefi, Mala-Hassan and Toli-Mawelian recorded lowest values of radical, plumule and total seedling dry weights which were 11.667mg 8.367mg and 20.034mg respectively (figure-1). Radical and plumule growth inhibition rate were at highest levels with the three varieties of Taefi, Mala-Hassan and Toli-Mawelian which was 75% while the lowest record data were 29.811% of radical growth and 48.489% of plumule growth (Fig. 2).

These results revealed the existence of allelopathic compounds in the aqueous extracts of grapevine berries with differences of the these allelochemicals effect of each grapevine variety which causes the inhibitory effects on the seed germination rate and the growth of the seedling of lettuce seeds (Khan *et al.*,1999, Akhtar *et al.*,2001 and Uremis *et al.*, 2005),

Table 3. Effect of the combination of grapevaline variety and aqueous extracts concentration on germination and growth parameters of lettuce seeds.

#	Plant species	cone.	Germination %	Inhibition %	Germination speed Mean seedling /day	Radical length Mean (cm)	Radical elongation speed Mean (cm/	Plumule length Mean (cm)	Plumule elongation speed Mean (cm /day)
1	Taefi	Control	100.000 a	0.000 i	13.663 a	3.280 a	0.413 a	2.493 a	0.312 b
		5%	36.667 ghi	63.333 abc	4.167 kl	0.000 l	0.000 j	0.000 g	0.000 c
		10%	95.000 abc	5.000 ghi	8.653 fg	0.000 l	0.000 j	0.000 g	0.000 c
		15%	76.667 de	23.333 ef	9.357 ef	0.000 l	0.000 j	0.000 g	0.000 c
	zareg-dohuok	Control	100.000 a	0.000 i	13.663 a	3.280 a	0.413 a	2.493 a	0.312 b
		5%	78.333 cde	21.667 efg	3.940 kl	1.070 ghij	0.133 gh	0.387 ef	0.060 c
		10%	85.000 abede	15.000 efghi	7.153 ghi	0.000 l	0.000 j	0.000 g	0.000 c
		15%	75.000 e	25.000 e	4.840 jk	0.000 l	0.000 j	0.000 g	0.000 c
3	Baetmuni	Control	100.000 a	0.000 i	13.663 a	3.280 a	0.413 a	2.493 a	0.312 b
		5%	98.333 ab	1.667 hi	11.667 abed	2.233 b	0.280 b	0.827 bcd	0.486 a
		10%	95.000 abc	5.000 ghi	7.010 ghi	0.693 ijk	0.080 hi	0.493 def	0.062 c
		15%	93.333 abc	6.667 fgh i	10.277 def	1.510 defg	0.193 cd el	0.553 cdef	0.073 c
4	Black Manga	Control	100.000 a	0.000 i	13.663 a	3.280 a	0.413 a	2.493 a	0.312 b
		5%	88.333 abede	11.667 efghi	11.650 abed	1.113 ghi	0.140 fg	0.547 cdef	0.068 c
		10%	88.333 abede	11.667 efghi	9.417 ef	0.550 k	0.070 i	0.390 ef	0.048 c
		15%	91.667 abede	8.333 efghi	9.473 ef	0.000 l	0.000 j	0.000 g	0.000 c
5	Sarqala Bakrajo	Control	100.000 a	0.000 i	13.663 a	3.280 a	0.413 a	2.493 a	0.312 b
		5%	96.667 ab	3.333 hi	11.263 cde	1.867 bede	0.237 bcd	0.867 be	0.108 c
		10%	91.667 abede	8.333 efghi	12.860 abc	1.973 bcd	0.247 be	1.067 b	0.133 c
		15%	98.333 ab	1.667 hi	10.250 def	2.060 be	0.260 b	0.707 cde	0.088 c
6	Awelka	Control	100.000 a	0.000 i	13.663 a	3.280 a	0.413 a	2.493 a	0.312 b
		5%	95.000 abc	5.000 ghi	6.783 ghij	1.420 efgh	9.180 defg	0.867 be	0.099 c
		10%	91.667 abede	8.333 efghi	9.223 ef	1.600 cdef	0.200 cde	0.800 bcd	0.100 c
		15%	88.333 abede	11.667 efghi	8.617 fg	0.633 jk	0.080 hi	0.307 fg	0.038 c
7	Rash merii	Control	100.000 a	0.000 i	13.663 a	3.280 a	0.413 a	2.493 a	0.312 b
		5%	96.667 ab	3.333 hi	13.380 ab	1.933 bcd	0.243 be	0.793 bcd	0.100 c
		10%	91.667 abede	8.333 efghi	12.500 abc	0.000 l	0.000 j	0.000 g	0.000 c
		15%	93.333 abed	6.667 fgh i	6.950 ghi	0.000 l	0.000 j	0.000 g	0.000 c
8	Mala Hassan	Control	100.000 a	0.000 i	13.663 a	3.280 a	0.413 a	2.493 a	0.312 b
		5%	78.333 cde	21.667 efg	9.443 ef	0.000 l	0.000 j	0.000 g	0.000 c
		10%	50.000 fg	50.000 cd	6.500 hij	0.000 l	0.000 j	0.000 g	0.000 c
		15%	30.000 i	70.000 a	1.420 m	0.000 l	0.000 j	0.000 g	0.000 c
9	Ashgar Basraha	Control	100.000 a	0.000 i	13.663 a	3.280 a	0.413 a	2.493 a	0.312 b
		5%	96.667 ab	3.333 hi	11.633 abed	1.360 fgh	0.170 efg	0.713 cde	0.089 c
		10%	46.667 fgh	53.333 bcd	11.720 abed	0.000 l	0.000 j	0.000 g	0.000 c
		15%	28.333 i	71.667 a	1.470 m	0.000 l	0.000 j	0.000 g	0.000 c
10	Kamalii	Control	100.000 a	0.000 i	13.663 a	3.280 a	0.413 a	2.493 a	0.312 b
		5%	85.000 abede	15.000 efghi	11.313 bede	1.027 hij	0.130 gh	0.493 def	0.062 c
		10%	91.667 abdee	8.333 efghi	8.720 fg	0.000 l	0.000 j	0.000 g	0.000 c
		15%	30.000 i	70.000 a	3.887 kl	0.000 l	0.000 j	0.000 g	0.000 c
11	Toli Mawelian	Control	100.000 a	0.000 i	13.663 a	3.280 a	0.413 a	2.493 a	0.312 b
		5%	90.000 abede	10.000 efghi	8.250 fgh	0.000 l	0.000 j	0.000 g	0.000 c
		10%	85.000 abede	15.000 efghi	6.333 hij	0.000 l	0.000 j	0.000 g	0.000 c
		15%	25.000 i	75.000 a	2.300 lm	0.000 l	0.000 j	0.000 g	0.000 c
12	Shekh nuraddin	Control	100.000 a	0.000 i	13.663 a	3.280 a	0.413 a	2.493 a	0.312 b
		5%	81.667 bede	18.333 efgh	5.787 ijk	1.600 cdef	0.200 cde	0.793 bcd	0.099 c
		10%	60.000 f	40.000 d	4.063kl	0.000 l	0.000 j	0.000 g	0.000 c
		15%	31.667 hi	68.333abc	1.467 m	0.000 l	0.000 j	0.000 g	0.000 c

Common letter means that there was non-significant at 1% probability level by Duncan's test.

The effect of Grapevine berries aqueous extracts concentration on the studies parameters

Table (2) illustrates the significant effect (P≥0.01) of different concentrations of grapevine berries aqueous extracts on some of the data that was recorded in this study. The highest values for germination rate 100%, speed of germination 13.663 seed.day^{-1}, radical length 3.280cm, radical elongation velocity 0.413cm.day^{-1}, plumule length 2.493cm, plumule elongation velocity 0.312 cm.day^{-1}, were observed with the control

treatments while lowest data for the above parameters were recorded with the highest studied concentration which was15% of grapevine berries aqueous extracts, mean while the germination inhibition rate studied highest data 36.528% was recorded with concentration 15%. Lettuce seedlings plumule, radical and total dry weight 33.466mg, 46.667mg and 80.133mg respectively were recorded with control treatments mean while lowest data 0.311 mg, 1.072 mg and 1.383mg were observed at highest studied concentration 15% (Figure-3). Plumule and radical growth inhibition rates recorded highest values 94.704% and 89.283% respectively were allocated with the highest studies concentrations 15% of grapevine berries aqueous extracts meanwhile the lowest data were recorded with control treatments (Fig. 4).

Table 4. Effect of the combination of grapevaline variety and aqueous extracts concentration on some growth parameters of lettuce seeds.

#	Plant species	cone.	Radical Dry weight Mean (mg)	Plumule dry weight Mean (mg)	Total dry weight Mean (mg)	Radical Growth Inhibition Rate	Plumule Growth Inhibition Rate
1	Taefi	Control	46.667 a	33.467 a	80.133a	0.000 j	0.000 h
		5%	0.000 b	0.000 d	0.000 b	100.000 a	100.000 a
		10%	0.000 b	0.000 d	0.000 b	100.000 a	100.000 a
		15%	0.000 b	0.000 d	0.000 b	100.000 a	100.000 a
	zareg-dohuok	Control	46.667 a	33.467 a	80.133a	0.000 j	0.000 h
		5%	2.333 b	3.800 b	6.133 b	67.418 cd	84.076 b
		10%	0.000 b	0.000 d	0.000 b	100.000 a	100.000 a
		15%	0.000 b	0.000 d	0.000 b	100.000 a	100.000 a
3	Baetmuni	Control	46.667 a	33.467 a	80.133a	0.000 j	0.000 h
		5%	3.867 b	1.167 cd	5.033 b	32.3072 i	66.169 fg
		10%	2.833 b	0.900 cd	3.733 b	78.746 bc	80.305 bc
		15%	4.233 b	0.400 d	4.633 b	54.050 efg	77.207 bcde
4	Black Manga	Control	46.667 a	33.467 a	80.133a	0.000 j	0.000 h
		5%	3.300	1.333 cd	4.633 b	65.627 de	78.048 bcd
		10%	2.400	1.233 cd	3.633 b	83.209 b	84.233 b
		15%	0.000 b	0.000 d	0.000 b	100.000 a	100.000 a
5	Sarqala Bakrajo	Control	46.667 a	33.467 a	80.133a	0.000 j	0.000 h
		5%	3.967 b	0.833 cd	4.800 b	42.354 ghi	65.604 fg
		10%	3.767 b	0.633 cd	4.400 b	39.919 hi	56.755 g
		15%	3.200 b	0.467 cd	3.667	36.973 i	71.599 cdef
6	Awelka	Control	46.667 a	33.467 a	80.133a	0.000 j	0.000 h
		5%	4.533 b	3.867 b	8.400 b	56.824 def	65.275 fg
		10%	3.867 b	0.967 cd	4.833 b	50.974 fgh	67.282 ef
		15%	3.100 b	0.767 cd	3.867 b	80.376 b	87.653 b
7	Rash merii	Control	46.667 a	33.467 a	80.133a	0.000 j	0.000 h
		5%	3.400 b	1.500 cd	4.900 b	41.220 hi	67.735 def
		10%	0.000 b	0.000 d	0.000 b	100.000 a	100.000 a
		15%	0.000 b	0.000 d	0.000 b	100.000 a	100.000 a
8	Mala Hassan	Control	46.667 a	33.467 a	80.133a	0.000 j	0.000 h
		5%	0.000 b	0.000 d	0.000 b	100.000 a	100.000 a
		10%	0.000 b	0.000 d	0.000 b	100.000 a	100.000 a
		15%	0.000 b	0.000 d	0.000 b	100.000 a	100.000 a
9	Ashgar Basraha	Control	46.667 a	33.467 a	80.133a	0.000 j	0.000 h
		5%	3.033 b	1.300 cd	4.333 b	58.692def	71.376 cdef
		10%	0.000 b	0.000 d	0.000 b	100.000 a	100.000 a
		15%	0.000 b	0.000 d	0.000 b	100.000 a	100.000 a
10	Kamalii	Control	46.667 a	33.467 a	80.133a	0.000 j	0.000 h
		5%	3.200 b	2.133 c	5.333 b	68.766 cd	80.001 bc
		10%	0.000 b	0.000 d	0.000 b	100.000 a	100.000 a
		15%	0.000 b	0.000 d	0.000 b	100.000 a	100.000 a
11	Toli Mawelian	Control	46.667 a	33.467 a	80.133a	0.000 j	0.000 h
		5%	0.000 b	0.000 d	0.000 b	100.000 a	100.000 a
		10%	0.000 b	0.000 d	0.000 b	100.000 a	100.000 a
		15%	0.000 b	0.000 d	0.000 b	100.000 a	100.000 a
12	Shekh nuraddin	Control	46.667 a	33.467 a	80.133a	0.000 j	0.000 h
		5%	3.433 b	1.333 cd	4.767 b	51.098 fgh	68.454 def
		10%	0.000 b	0.000 d	0.000 b	100.000 a	100.000 a
		15%	0.000 b	0.000 d	0.000 b	100.000 a	100.000 a

Common letter means that there was non-significant at 1% probability level by Duncan's test.

Table 5. Grapevine varitey chemical characters.

Variety	Glycoside	Saponines	Tannins	Phenolic compounds	Alkaloids
Taefi	+	-	+	+	-
Zareg-dohuok	+	-	+	+	-
Baetmuni	+	-	+	+	-
Black-Manga	+	-	+	+	-
Sarqala-Bakrajo	+	-	+	+	+
Awelka	+	-	+	+	-
Rash-merii	+	-	+	+	+
Mala-Hassan	+	-	+	+	+
Ashgar-Basraha	+	-	+	+	-
Kamalii	+	-	+	+	+
Toli-Mawelian	+	-	+	+	-
Shekh-nuraddin	+	-	+	+	+

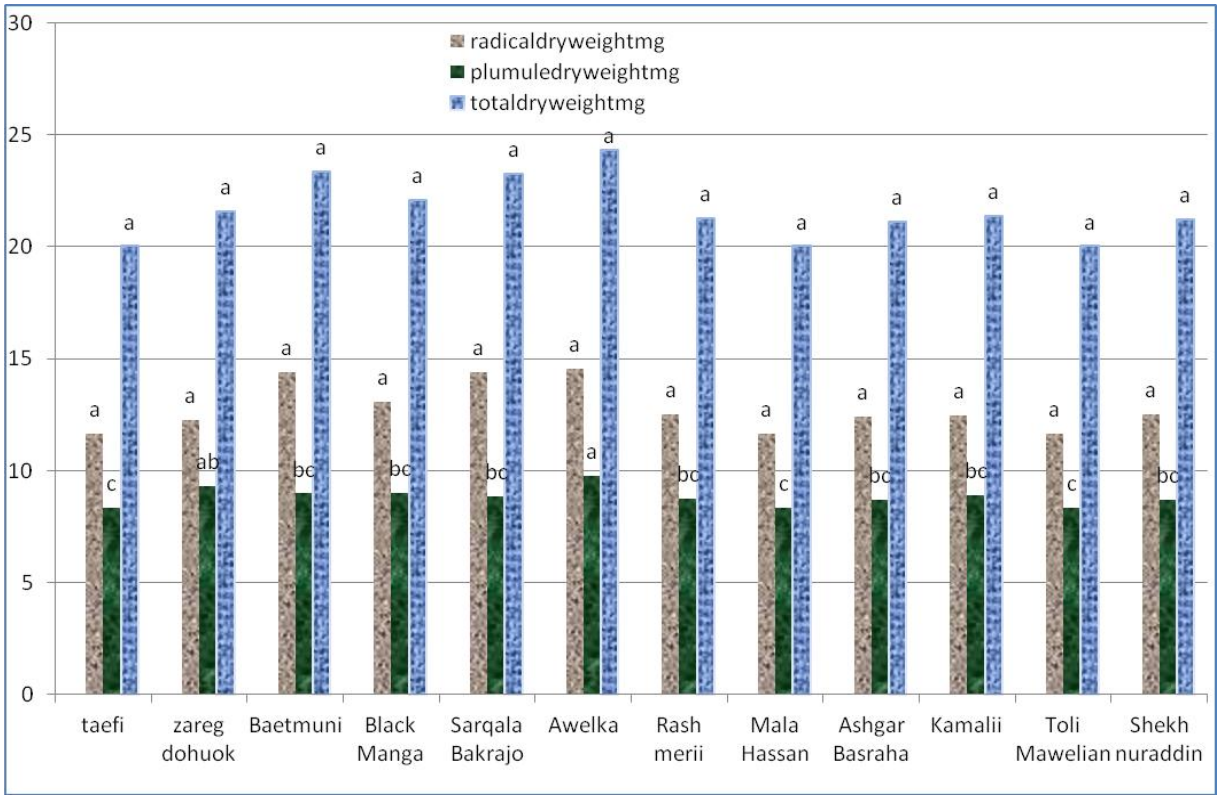

Fig. 1. The effect of grapevine varieties on the lettuce seedlings plumule, radical and total seedlings dry weight (mg).

Results of this study suggest that plant species response will be differ to different concentrations of the used aqueous extract (Rafiqul-Hoque *et al.,* 2003 and Ben hammuda *et al.,* 2001) which be an ideal evidence of the concentration effect of the compounds that exist in the used aqueous extracts (Ussalam *et al.,* 2011).

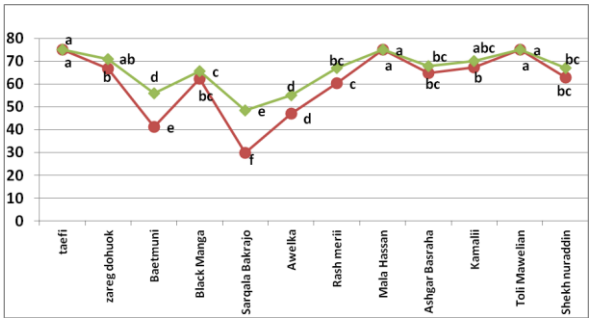

Fig. 2. The effect of grapevine varieties on Lettuce seedlings plumule and radical growth inhibition rates.

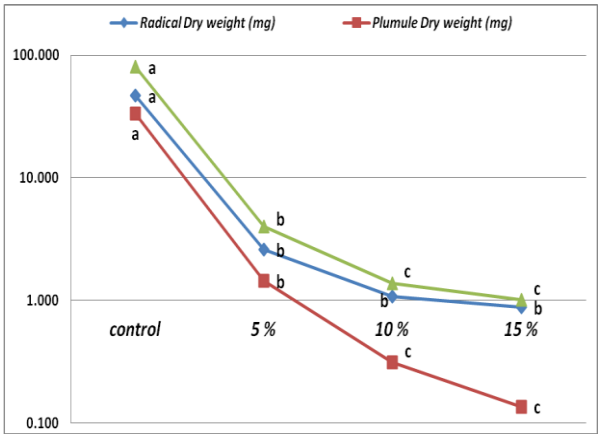

Fig. 3. The effect of grapevine berries aqueous extracts on lettuce seedlings plumule, radical and total dry weights (mg).

The effect of combination of grapevine varieties and grapevine berries aqueous extracts concentration on the studies parameters

The combination of the two studied factors grapevine varieties and grapevine berries aqueous extracts revealed significant differences (P≥0.01) on germination rate, inhibition of germination, germination speed, plumule and radical length, elongation speed of both plumule and radical of lettuce seedlings (Table 3). Whereas highest germination rate 100% was recorded with control treatments of all studied varieties, meanwhile highest inhibition of germination rate was 68.333 % recorded with the concentration of 15% of grapevine berries of Shek-nuraddin variety. Highest germination speed was 13.633 seedling.day^{-1} considered with control treatment, mean while lowest germination speed revealed 1.420 seed.day^{-1} with concentration of 15% of Mala-hassan variety, highest radical and plumule length were observed with control treatment and the same phenomenon was noticed with radical and plumule elongation speed. Lettuce seedlings plumule and radical dry weight were observed recorded and obtained significant differences as shown in (Table 4).

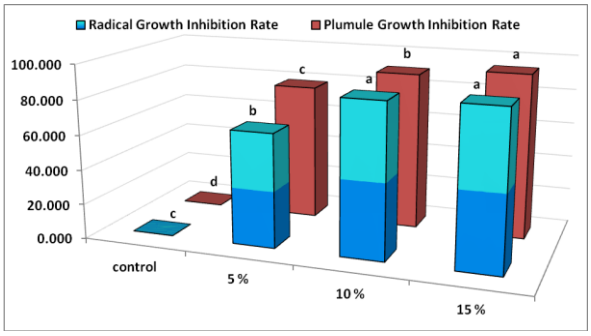

Fig. 4. The effect of grapevine Berries aqueous extracts concentration on Lettuce seedlings plumule and radical growth inhibition rates.

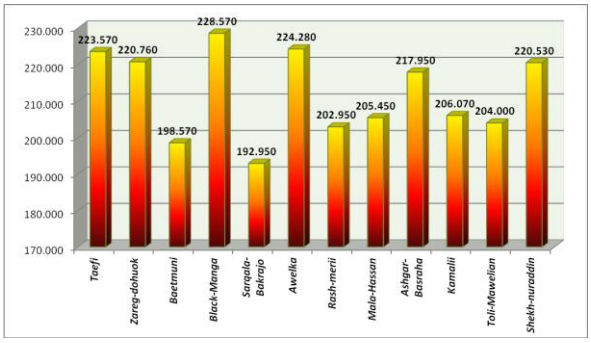

Fig. 5. The levels of total polyphenols in the grapevine berries in part per million.

Grapevine berries chemical characters

The existence of chemical compounds such as Alkaloids, poly phenolic compounds, Tannins, Saponnins, and Glycosids for the twelve grapevine varieties were recorded as shown in (Table 5), where there is obvious differences in the existence of alkaloids which only exist in five verities, meanwhile poly phenolic compounds, tannins and Saponnins exist in all studied varieties. Polyphenolic compounds were at highest level in Black-manga variety (figure-5), while total soluble compounds were at highest level in ashgar-Basrah variety (Fig. 6).

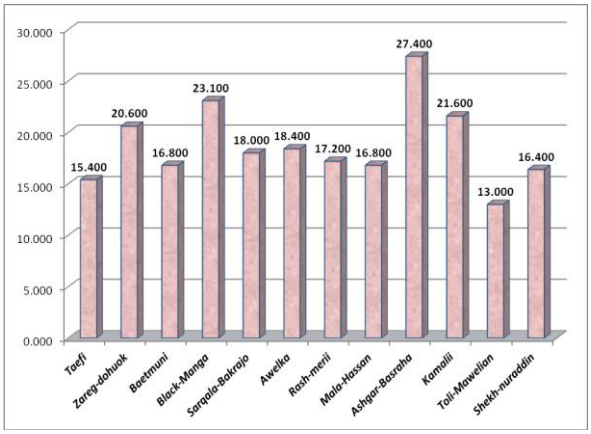

Fig. 6. The total soluble solids compound percentages in grapevine berries.

In this study grapevine berries exposed different levels of total soluble solid compounds and total poly phenol levels which may reveals the inhibitory effects of the aqueous extracts, mean while increasing the concentration lead to rising the inhibitory effect in all tested grapevine varieties (Taiz and Zeiger, 2006; Lambers *et al.,* 2008).

Conclusion

This research demonstrates the allelopathical potential of grapevine berries aqueous extracts which differs from variety to another and the inhibitory effect increased with increasing the concentration the tested aqueous extract. These inhibitory effects may be related to the different compound that needs more studies to reveal the responsible compounds.

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