Egypt. J. Exp. Biol. (Bot.), 16(2): 191 – 201(2020)
DOI: 10.5455/egyjebb.20201027122700

AARU Impact Factor: 1.3

RESEARCH ARTICLE

Reham M. Mostafa
Heba S. Essawy

Efficacy of plant extracts of two species of Chenopodiaceae on the germination and seedling growth of beans (*Phaseolus vulgaris*)

ABSTRACT:

This study was conducted to examine the allelopathic potential of aqueous extracts (A.E.) of two wild plants *Bassia muricata(B. muricata)* and *Chenopodium mural (Ch. Mural)* at Different concentration (1, 5, 10, 15,20, and 25% w/v) in addition to 0% (tap water) as control ,on seed germination, seedling growth and chlorophyll ,protein and sugar content of *Phaseolus vulgaris* .L. (Kidney bean). Gas chromatography mass spectrum (GC.MS) analysis revealed the presence of 33 bioactive compounds for *Ch. mural* extracts and 31 compounds for *B. muricate* and this analysis showed the presence of many compounds as fatty acid, aliphatic hydrocarbon, polyphenol and sterols. The obtained results indicated that shoot aqueous extract (S.A.E) of *B. muricata* and *Ch. mural* at (1% to 15%); (1% and 5%), respectively as seed soaking for 24 hours stimulated germination percentage and support all tested morphological and physiological parameter of the *Phaseolus vulgaris* plants, while the reduction was observed at (20 and 25% w/v) in *B. muricata* and the completely inhibition of *Ch. Mural* extract was started from 10% as compared with the untreated control plant. The stimulating effect for both wild plants may be related to the presence of the polyphenolic compounds and steroidal hormones according to the concentration. The phytotoxic activity (completely inhibition) of *Ch. mural* could be related to the presence of coumarin and its derivatives (3-(3,4-dimethoxyphenyl)-7-methyl-4-phenylcoumarin).

KEY WORDS:

Allelochemicals; *Bassia muricata;* Bioactive compounds; *Chenopodium mural;* GC-mass.

CORRESPONDENCE:

Heba Samy Essawy

Botany department, faculty of science, Benha University, Benha 13518, Egypt.

E-mail: HEBA.ESSAWY@fsc.bu.edu.eg

Reham M.Mostafa

Botany department, faculty of science, Benha University, Benha 13518, Egypt.

ARTICLE CODE:18.02.20

INTRODUCTION:

Allelopathy is a multifactorial phenomenon that be influenced by the concentration of allelochemicals. It has both inhibitory and stimulatory effects depending on the concentration of allelochemicals present in the extract. Many publications in the allelopathy field focused on the growth inhibitory action of allelochemicals, while neglecting their stimulatory effects. However, the stimulation of plant growth by residues or extracts of other plants is also proved (Saleh, 2013; Madany and Khalil, 2017; Khalil *et al.,* 2020). The common bean (*Phaseolus vulgaris* L.) is one of the most important legume crops grown in all continents of the world because of its high protein, fibre, and complex carbohydrate content (Broughton *et al.,* 2003). They have also useful effects on human health, being very low in sodium, rich in thiamine, zinc, copper, iron, magnesium potassium, and phosphorus, calcium and are cholesterol free (Iqbal *et al.,* 2006). Chenopodiaceae (Amaranthaceae) is a large family including 174 genera and 2100-2500 species distributed all over the world with high nutritional and medicinal values (Adedapo *et al.,* 2011). The genus Chenopodium consists of 200 species (Boulos *et al.,* 1983). This genus has great importance due to their wide variety of medicinal

properties, such as an anthelmintic, stomachic, antispasmodic and migraine (Vasishita, 1989). *Ch. murale* (nettle-leaved goosefoot; family Chenopodiaceae) is an annual problematic weed found extensively in the arable lands (Holm *et al.,* 1979). A native of Europe, the weed has founded in many parts of the world including Egypt (Shaltout and El-Ghareeb, 1992). *Ch. murale* is an annual erect plant with large dispersal rates, due to large number of seeds produced by a plant that can reach up to 24,000 seeds/plant (Guertin, 2003). Field observations reveal that *Ch. murale* competes with crops and causes reduction in crop qualities and yields (Anonymous, 1992). Batish *et al.* (2007) showed that root exudates and residues of *Ch. murale* significantly affect the wheat growth by providing the soil rhizosphere with phenolic allelochemicals. Báthory *et al.* (1982) observed that the Chenopodium species were contain sterols and steroidal oestrogens like substances. *B. muricata* is a chenopod common herb in sandy soils and at the margins of desert roads. It is recorded in Iran, Palestine, Arabia and North Africa (Shaker *et al.,* 2013) in Egyptian deserts (Tackholm, 1974). Genus *B. muricata* belonging to family Chenopodiaceae with high nutritional and medicinal values. For instance, in folk medicine *B. muricata* is used as remedy for rheumatic and renal diseases and possess different degrees of anti-inflammatory, analgesic, antipyretic, as well as antispasmodic effects. Its ether and benzene extracts showed antimicrobial activity (Al-Yahya *et al.,* 1990*). B.muricata* was found to contain triterpenoidal saponins and acetyl flavonoid glycosides (Kamel *et al.,* 2001).

MATERIAL AND METHODS:

Plant materials:

A seed of Beans (*Phaseolus vulgaris*) was kindly obtained from the Department of Vegetables, Agriculture Research Centre, Giza; Egypt. Wild plants *B. muricata* and *Ch. mural* were collected from the Al-fayom, Egypt. only shoot system of the two wild plants were collected and then dried in oven dried at 50°C after 10 days for constant weight and grinded to fine powder in a mixer and finally stored until used.

Preparation of extract:

The shoot extract was prepared by soaking 100 gram of plant powder in 100 ml distilled water for 24 hours at room temperature and that considered as 100% shoot extract (w/v).

Pot experiment:

We prepared different concentration of aqueous shoot extract (1,5,10,15,20 and 25% w/v) for two wild plants (A.E) to study the effect of different concentrations of two wild plants aqueous treatments on the growth of Beans (*Phaseolus vulgaris*) aiming to choose the proper rates of these treatments. This experiment was carried out in Botany Department Faculty of Science, Benha University. The seeds of Beans (*Phaseolus vulgaris*) surface sterilized with 1% of sodium hypo-chloride for 5 min and washed thoroughly with sterilized distilled water and then soaking in different concentration of two wild plants (A.E). Beans seed where divided into 7 groups for each plant each group has 5 replicates (9 seeds), first group was soaked in distilled water 24 hours (sever as control) while the remaining groups were pre-soaked for 24 hours (1, 5, 10, 15, 20, and 25%w/v) A.E of two wild plants. Nine seeds of each treatment were sown in each plastic pots filled with sandy: clay (1: 2; w/w). Seeds irrigated with tap water when needed to maintain an optimal soil moisture regime (water holding capacity) throughout the experiment. After 15 days at the seedling stage, seven pots of each group were taken then the bean plants were harvest and their roots where washed thoroughly with water to remove adhering soil particles. Some growth parameters were taken. These include, germination rate, lengths of main root, stem as well as the number of leaves per plants, leaf area were recorded and the seedling vigour was determined as the following formula of Varadarajan and Prakasa Rao (2002) as shown below:

Vigour index (VI) = Percent germination of seed × (Root length + Shoot length).

The plants were separated into roots, stems then the fresh weight was measured. Samples were dried in oven at 70°C till weight constant to determine the dry weight. While fresh leaves were kept in refrigerator for biochemical analysis.

Physiological parameters:

Estimation of photosynthetic pigment

Chlorophyll a, chlorophyll b and carotenoids were determined using spectrophotometric method recommended by Metzner *et al*. (1965) The method of Arnon (1949) was used in chlorophyll extraction and the concentration of the pigment fractions were calculated as µg/ ml using the following equations:

Chlorophyll (*a*) = 10.3 x O.D 633 – 0.918 x OD 644 = µg/ml.

Chlorophyll (*b*) = 19.7 x O.D 644 – 3.87 x OD 633 = µg/ml.

Carotenoids = 4.2E452.5- (0. 0264chl.a + 0.4260chl. b= µg/ml

The fractions were calculated as µg/g dry weight of the differently tested plant waves.

Estimation of Soluble sugars:

Total soluble sugars were analysed according to the method adopted by Eltayeb

et al. (2007). In distilled water a known weight (0.5 g) of fresh powdered tissues was boiled for 1 h in a water bath, and then centrifuged to obtain the extract. The total soluble sugars were determined using Nelson's reagent (Clark and Switzer, 1977).

Estimation of total protein:

The method of Bradford (1976) was used for estimation the proteins. Absorbance was recorded photometrically at 595 nm (Beckman 640 D, USA). Calibration curve was plotted by using bovine albumin to calculate percentage protein content in the samples

GC-mass:

Aglient 6890 gas chromatograph supplied with an Agilent mass spectrometric detector, with a direct capillary interface and fused silica capillary column PAS-5ms (30m x 0.32 mm x 0.25 µl film thickness). Samples were injected under the following conditions. Helium was used as carrier gas at approximately 1.0ml/min., pulsed split less mode. The solvent delay was 3 min and the injection size was 1.0 µl. The mass spectrometric detector was operated in electron impact ionization mode with an ionizing energy of 70 e.v (electron voltage)., scanning from m/z 50 to 500, the ion source temperature was 230°C. The electron multiplier voltage (EM voltage) was maintained 1650 v above auto tune. The instrument was manually tuned using perfluorotributylamine amine (PFTBA). The GC temperature program was started at 60°C (2 min) then elevated to 300°C at rate 5°C/min the injector temperature was set at 280°C respectively. Wiley and Wiley Nist mass spectral data base were used in the identification of the separated peaks. The previous analyses were done at the central pesticide's laboratory.

Statistical analysis:

The experiment was set up in a completely randomized design. The mean values of growth parameters were calculated from five replicates and all other mean values in the study were calculated from three replicates. All data were analysed statistically by one-way ANOVA using the Statistical Package for Social Science (SPSS) program. The bars in all figures represent standard deviations of the replicates from the means.

RESULTS AND DISCUSSION:

Morphological parameter:

Growth criteria values (rate of germination, shoot length, area of leaves, plant number of leaves, plant shoot fresh and dry weight and vigour index) of beans (*Phaseolus vulgaris*) seedlings in response to different concentrations (1, 5, 10, 15, 20, and 25% w/v) of *B. muricata* and *Ch. mural* A.E. (Figs1-3).

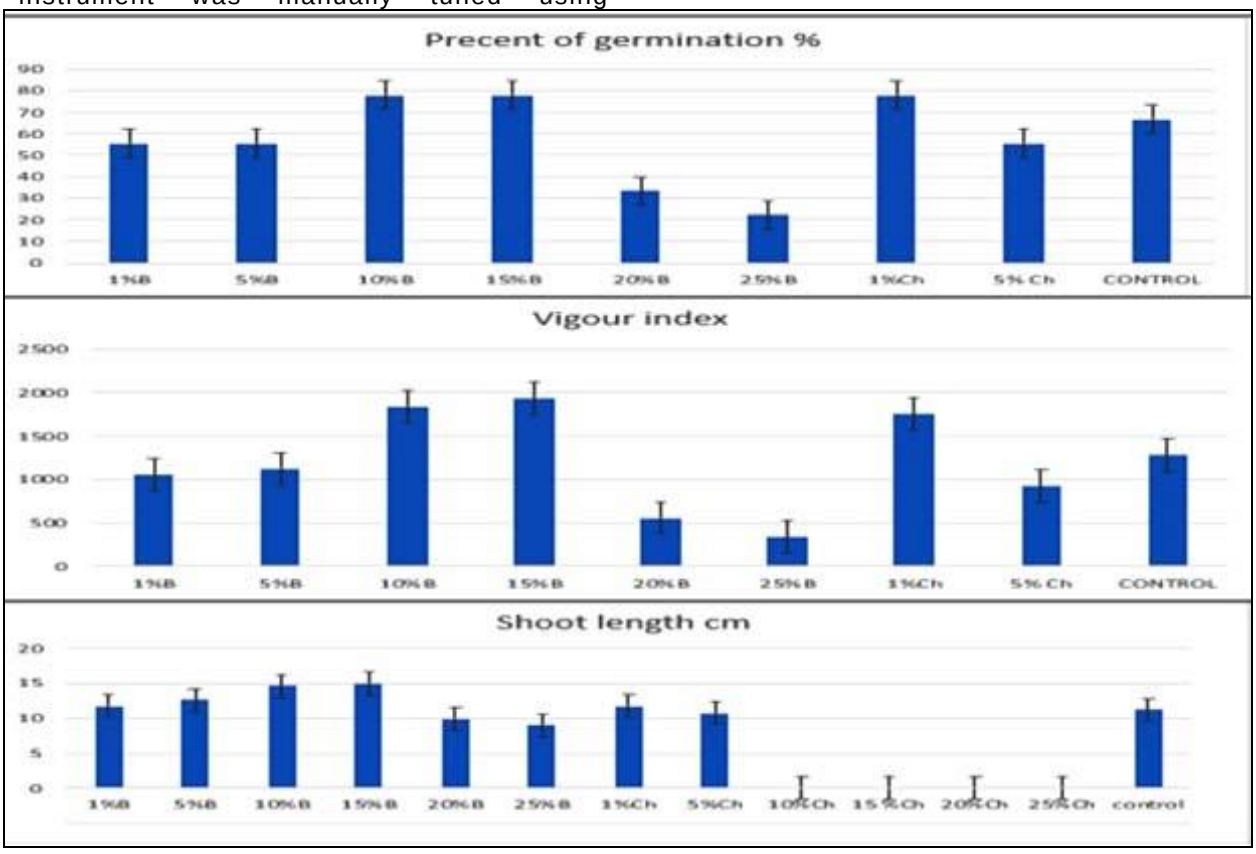


Fig .1. Effect of different concentrations of *Bassia muricata* (B) and *Chenopodium mural* (Ch) shoot extract upon Precent of germination, vigour index and shoot length.

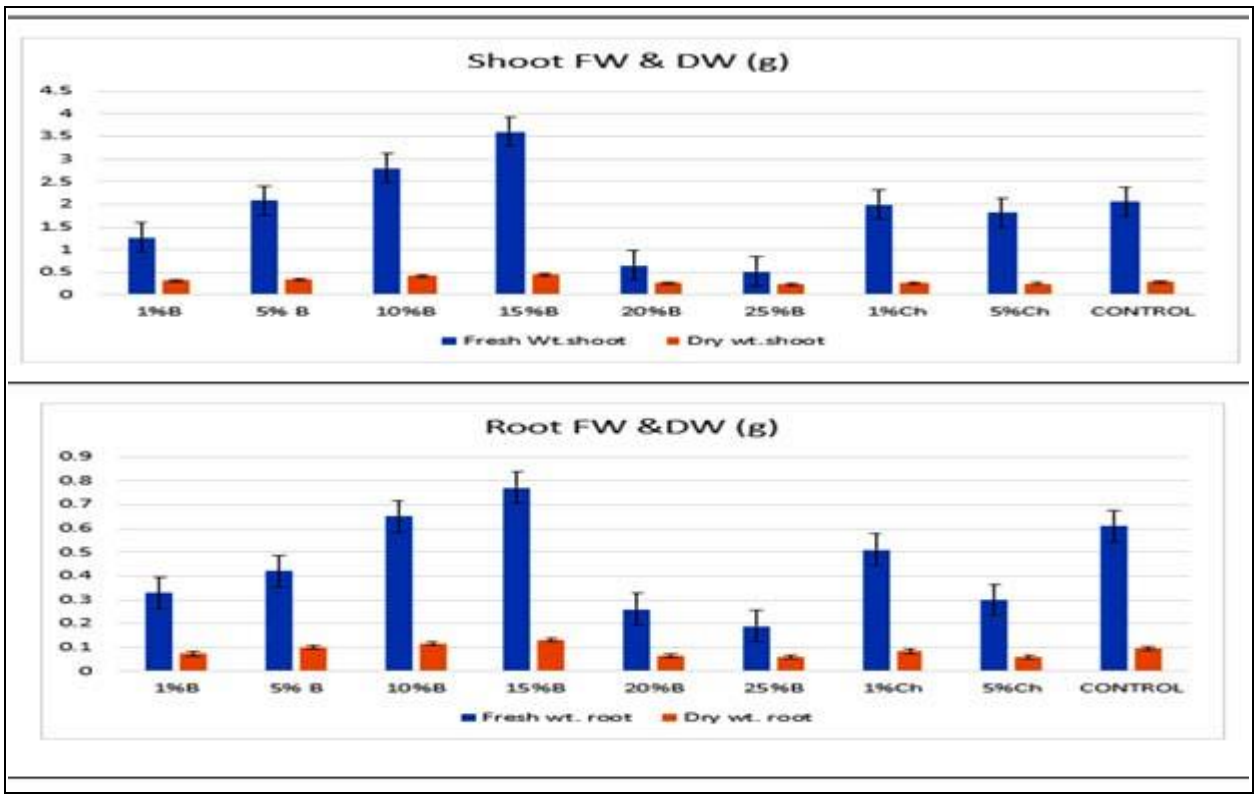


Fig. 2. Effect of different concentrations of *Bassia muricata* (B) and *Chenopodium mural* (Ch) shoot extract upon Root length, Number (N0.) of leaves and leaf area.

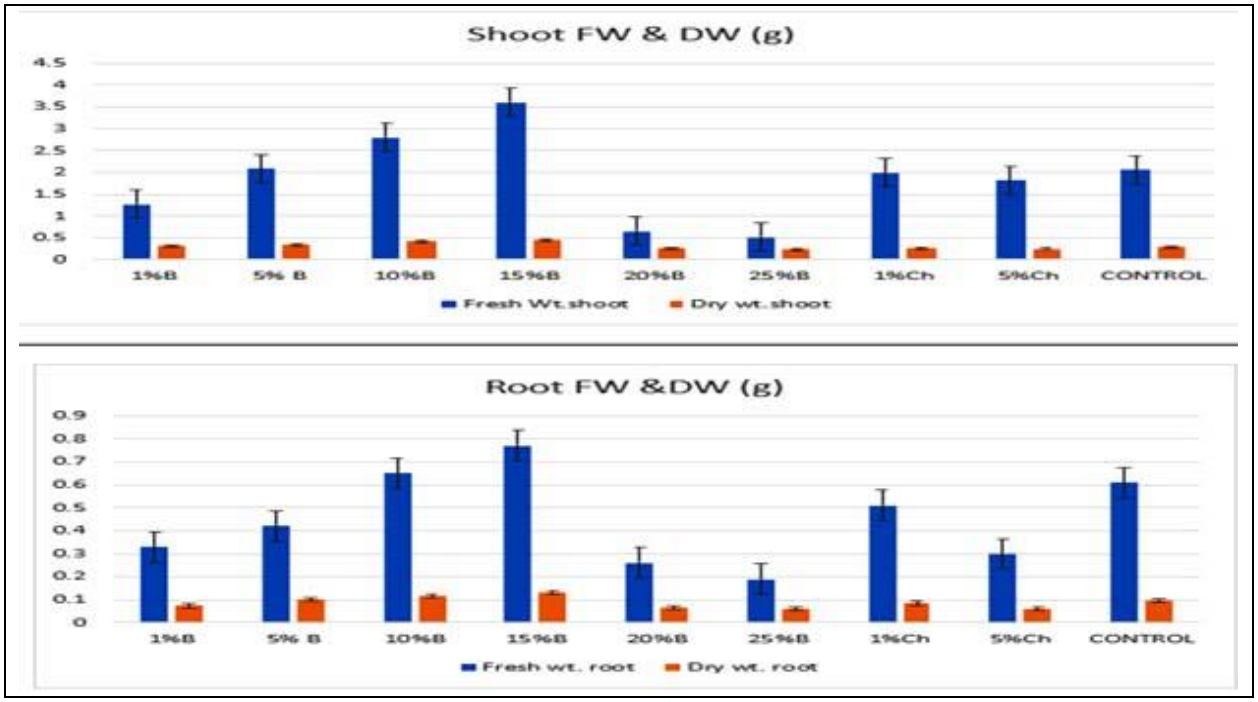


Fig. 3. Effect of different concentrations of *Bassia muricata* (B) and *Chenopodium mural* (Ch) shoot extract upon shoot and root fresh weight (FW) and dry weight (DW)

The results showed that the seed germination, shoot length, area of leaves/ plant, number of leaves/plant, and vigour index of the tested *Phaseolus vulgaris* plants were stimulated with *B. muricata* and *Ch. mural* A.E. concentrations from (1% to 15%); (1% and 5%) respectively. The positive effect value for *B. muricata* and *Ch. mural* A.E. was recorded at (15%) and (1%) respectively. But the reduction value was observed at (20 and 25%w/v) in *B. muricata* and the completely inhibition of *Ch. Mural* extract on beans seeds was started from 10% as compared with the untreated control plant. This confirms the findings of several studies as Al-Watban and Salama (2012) who reported that A.E. of aerial parts of *Artemisia monosperma* (1.0 and 2.0%, w/v) have stimulated the germination percentage of common bean seeds, (Parimelazhagan and Francis, 1999)

showed that the leaf extract of *Clerodendrum viscosum* caused an increase in germination rates and an enhancement in seedling development of rice seeds.

Bashir *et al.* (2003) established that the germination of tomato seeds enhanced by 20 - 80%. By using *M. oleifera* leaf extracts. Muhammad (2015) reported that moringa leaf extract at 5% encouraged cowpea rate germination and final germination percentage followed by Moringa leaf extract (MLE) at concentration of 2%. While Signaboubo *et al.* (2015) reported that seed treated with higher concentrations of the ethanolic extracts had lower germination percentage and vigour index than those treated with lower concentrations. Higher concentrations of the extracts could be phytotoxic to the seeds (Khalil *et al.,* 2020). The higher concentration of allelochemical had negative impact on the rate of seed germination as well as plumule length and seedling dry weight (Benyas *et al.,* 2010). Soltanipour *et al.* (2006) found that the aqueous extracts of *Thymus kotschyanus* had a considerable inhibitory effect on germination of *Bromus tomentellus* and *Trifolium repens*. Also, Oueslati (2003) and Siddiqui *et al.* (2009) they observed that the degree of inhibition increased with increasing allelochemical concentrations. In addition, Muhammad (2015) clear that the high level of moringa leaf extract MLE (6%) has inhibitor effect on the previous parameters as compared to 2% and 4% levels.

Physiological parameters:

In higher plants the photosynthesis is one of the most crucial indicators of physiological activities Therefore, impairing the plant's photosynthetic capacity could affect its carbon fixation and carbohydrate status. In our study the photosynthetic pigment levels of bean seedlings were noticeably enhanced by the different treatments of *B. muricata* (1% to 15% w/v) and *Ch. Mural* (1% and 5%) extract but for the highest rate of *B. muricata extract* (20% and 25% w/v) caused a reduction in their pigment levels (Fig. 4). The maximum values of Chl a, Chl b and carotenoids in bean seedlings were about 20.05, 8.60, and 15.84 mg/100, respectively, by using the 10% (w/v) of *B. muricate* extract and 1.63, 0.63, and 0.70 mg/100 by using the 1% (w/v) of *Ch. Mural while* minimum value of Chl a, Chl b and carotenoids in bean seedlings were about 1.37, 0.69 and 0.72 mg/100, respectively, by using the 25% (w/v) of *B. muricate* extract and 0.63, 0.29, and 0.27 mg/100 by using the 5% (w/v) of *Ch. Mural* relative to their corresponding bean untreated seedlings. These results are in line with Madany and Khalil (2017), the different levels of fenugreek seed extract improve the levels of chlorophyll a and b, as well as carotenoids in the seedlings of both faba bean and maize except for the highest rate (1.5 %; w/v). On the other hand, Tanveer *et al.* (2008) and Khalil *et al.* (2020) reported that the decrease in chlorophyll synthesis is a common response of plants to allelochemicals, and this might be a subsequent response of plant to these chemicals beside cellular damage. And the upcoming negative effects of these processes would be retarding of photosynthesis and poor plant growth.

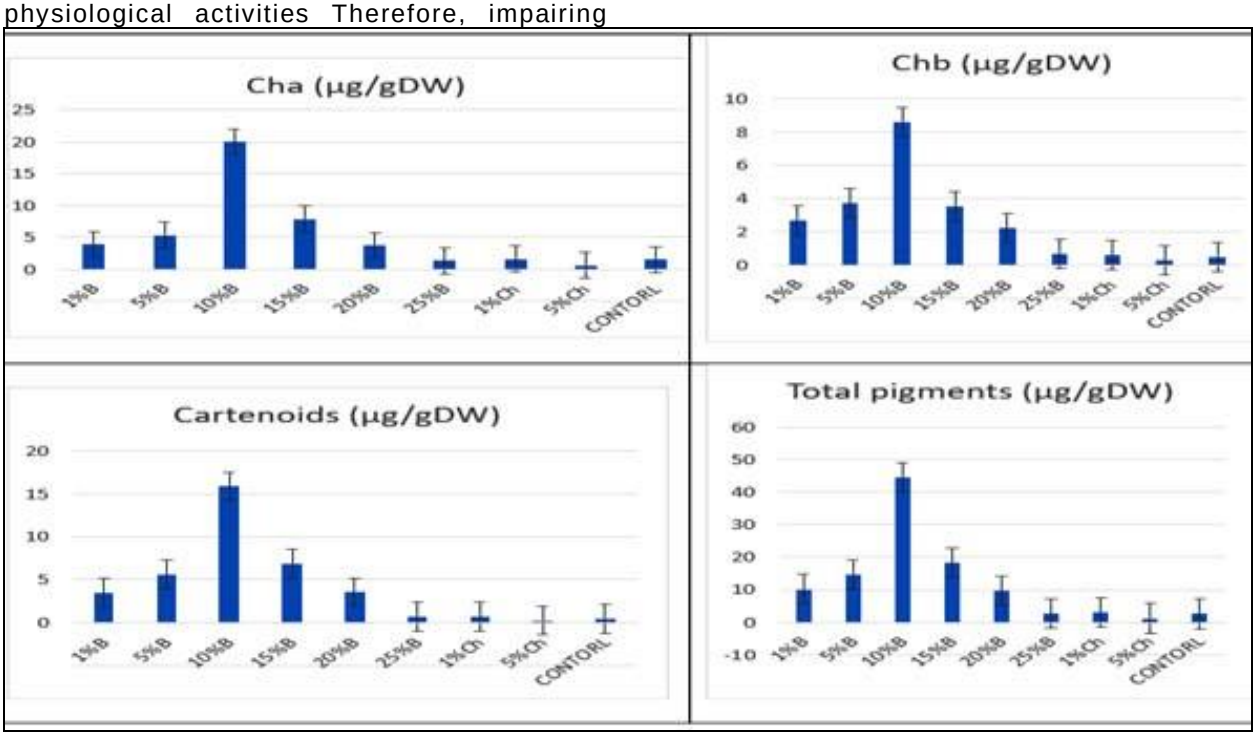


Fig. 4. Effect of different concentrations of *Bassia muricata* (B) and *Chenopodium mural* (Ch) shoot extract upon chlorophyll (chl) a, b, Carotenoids and total pigments.

In the present study the effects of A.E. of *B. muricata* and *Ch. Mural* plants on total soluble sugar content and soluble proteins of *Phaseolus vulgaris* plants are given in figure 5. The difference in the content of soluble sugars and soluble proteins in bean seedlings is clear under the different concentrations of *B. muricata* and *Ch. Mural* extract on bean seedlings showed a continual increase in soluble sugars and soluble protein levels that reached to the maximum value at 10% w/v for *B. muricate* and 1% w/v *Ch. Mural* extract when compared with those of non-treated plants. Madany and Khalil (2017) found that the treatment with fenugreek seed extract (0, 0.25, 0.50% (w/v) enhanced the accumulation of soluble sugars and protein in both faba bean and maize seedlings and reached the maximum value at 0.50% fenugreek concentration while, the highest level of fenugreek extract [1.0 or 1.50% (w/v)] reduce the content of soluble sugars and soluble proteins in both faba bean and maize seedlings.

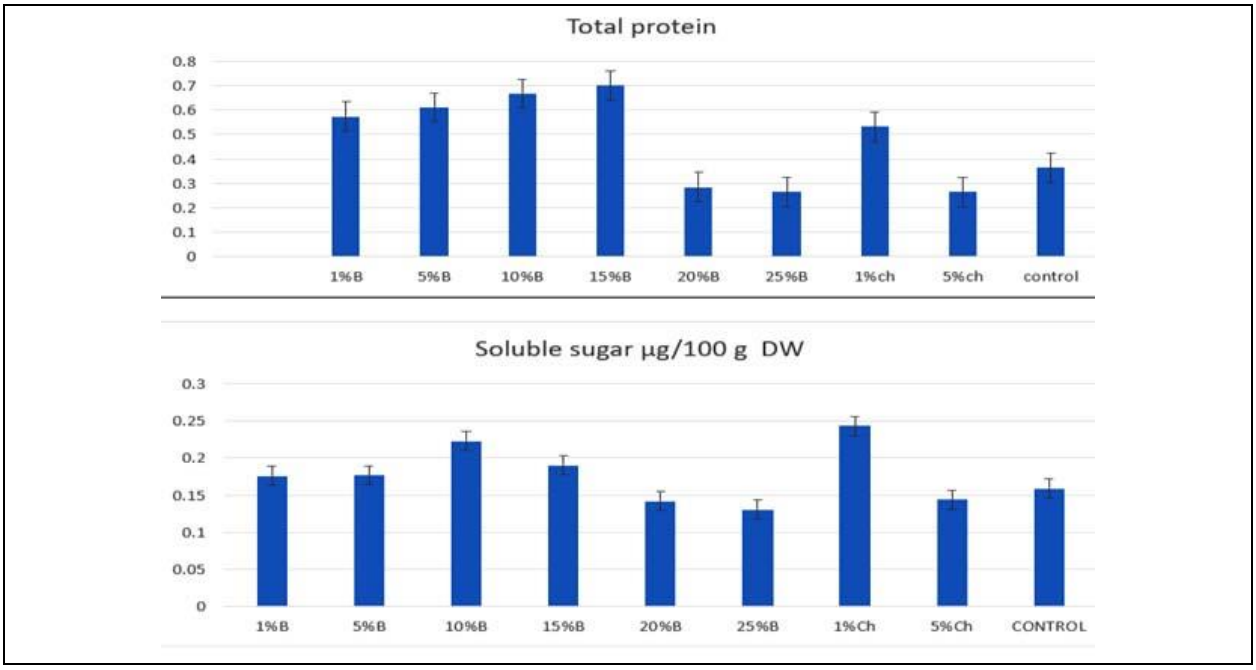
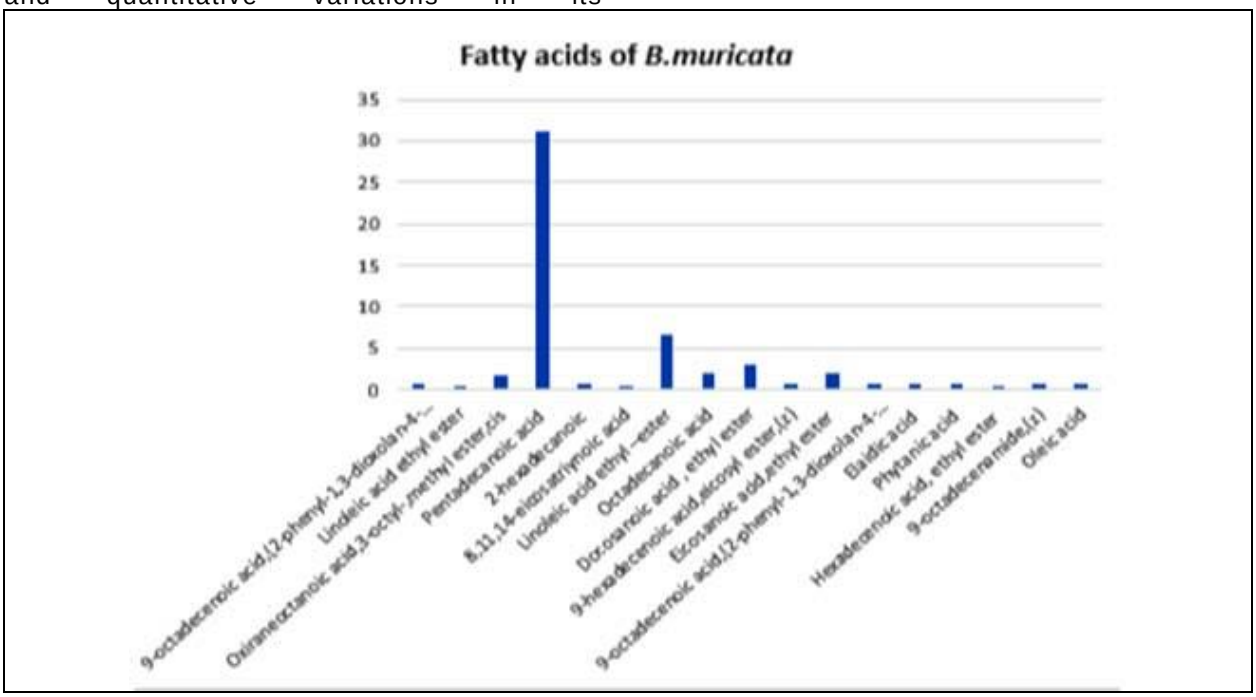


Fig. 5. Effect of different concentrations of *Bassia muricata* (B) and *Chenopodium mural* (Ch) Total protein and Soluble sugar

GC-mass analysis:

GC-MS analysis of A.E. of *Ch. mural* and *B. muricata* plants revealed qualitative and quantitative variations in its phytochemical compounds. sixty-four compounds were identified and quantified and their data were represented in figure 6 and table 1.



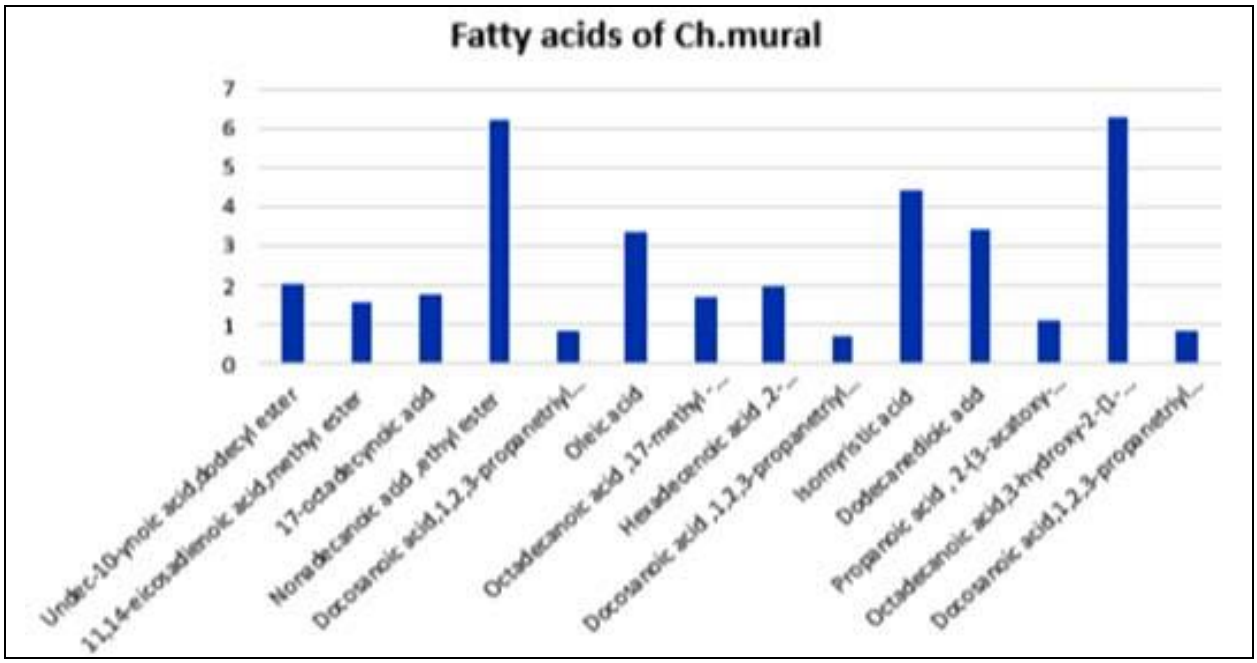


Fig. (6) The qualitative and quantitative analysis of fatty acids in *B. muricata* and *Ch. mural* shoot extract using GC-mass.

Table .1. The qualitative and quantitative analysis of active compounds in *B. muricata* and *Ch. mural* shoot extract using GC-mass.

Active compound	B.muricata	Ch.mural	Area
<u>Phenol</u>			
-Isovitexin	+(1.48)	+(0.6)	
-3,5,3,5-tetra-tert-butyldiphenoquinone.	+	-	0.69
-3,2,4,5-tetramethoxyflavone.	+	-	0.42
-3-hydroxy-2,4,5-trimethoxyflavone.	+	-	0.94
-4,7-dimethoxy-8-methylisoflavone.	-	+	0.4
-3-(3,4-dimethoxyphenyl)-7-methyl-4-phenylcoumarin.	-	+	1.03
-6,7,3,4-tetramethoxyisoflavone.	-	+	0.49
-3-hydroxy-3,4,5-trimethoxyflavone.	-	+	0.54
-3,5,3,5-tetra-tert-butyldiphenoquinone.	-	+	2.65
-3-(3,4-dimethoxyphenyl)-4-methylcoumarin.	-	+	0.49
-6,7,3,4-tetramethoxyflavone.	-	+	5.18
-Gardenin.	-	+	8.05
<u>Aliphatic Hydrocarbon</u>			
-Heptacosane,1-chloro.	+	-	4.63
-Heptacosane.	+	-	31.34
-1-hexacosene.	+	-	0.41
-Heneicosane.	+	-	5.63
-Pentacosane.	+(0.39)	+(11.9)	
-Heptadecane,9-octyl-.	-	+	7.89.
Alkane			
9-octadecene,1,1-(1,2-ethanediylbis{oxy})bis-,(z,z)	+	-	0.79
9-octadecene , 1-(2-{octadecyloxy}ethoxy).	+	-	0.33
Octadecane,3-ethyl-5-(2-ethylbutyl).	+	-	0.59
Tetratetracontane	+	-	10.78
Octadecane,3-ethyl-5-(2-ethylbutyl).	-	+	0.95
17-pentatriacontene.	-	+	0.5
<u>Steriods</u>			
Ouabagenin	+	-	1.64
Prednisone	-	+	0.36
β –sitosterol	-	+	1.12
<u>Terpene</u>			
1,4-benzenedicarboxylic acid,bis(4-butylphenyl)ester.	-	+	0.58
Phytanic, acid	-	+	3.56
<u>Vitamins</u>			
Acitretin	-	+	0.48

Phytochemicals are compounds such as fatty acid, aliphatic hydrocarbon, terpene, alkane, steroid, polyphenol and vitamin. There is a variety in percentage and number of secondary metabolites in the crude aqueous extract for both wild plants. The chromatographic analysis of *Ch. mural* showed the presence of many compounds such as 14 fatty acid (36.27%), 2 aliphatic hydrocarbon (35.97%), 9 phenolic compound (19.43%), 3 alkane (1.45%), 2 terpene (4.14), 1 vitamin A (0.48%) and 2 steroids (1.48%) .While in *B. muricate analysis 17* fatty acid (52.87%), 5 aliphatic hydrocarbon (26.22%), 4 phenol (3.53%), 1 steroid (1.64%), and 4 alkane (12.49%) .

The chromatographic of two A.E. for *Ch. mural* and *B. muricata* showed the major constituents were fatty acid, aliphatic hydrocarbon and phenols compounds. The present study shows that the A.E. of two studied wild plant have both stimulatory and inhibitory effect on *Phaseolus vulgaris seedling and this depend on the concentration of wild plant extract. stimulatory effect happens at low concentration (*1 to 15% w/v) of *B. muricata* and (1% and 5%) of *Ch. mural,* while the reduction was observed at (20 and 25% w/v) in *B. muricata* and the complete inhibition of *Ch. Mural* was started from 10%. The stimulating effect for both wild plants may be related to the presence of the polyphenolic compounds and steroidal hormones. In addition, the phenolic compounds in two extract of wild plants were able to promote or inhibit plant growth according to the concentration. These results are in agreement with the result observed by Keskitalo (2003) who reported that phenolic acids have been identified as allelopathic agents, which includes both positive and negative effects. Baziramakenga *et al.* (1997) found that the stimulation of protein synthesis and activation of antioxidant enzymes with the application of phenolic acids at low doses. The low concentrations of acetone fraction of *Ch. mural* (10, 50, and 100 ppm) and vanillic acid (0.1, 0.5, and 1.0 ppm) stimulated the germination and growth of the tested tomato, while higher concentrations had slight inhibitory effects (Momtaz and Hamada, 2010). Also, Reigosa *et al.* (1999) who reported the inhibitory effects of several phenolic compounds (ferulic, gallic, p-coumaric, p-hydroxybenzoic, vanillic acids and p-vanillin) on the germination and seedling growth of different weeds, whereas lower concentrations were of stimulatory effects. Polyphenols are secondary metabolites vital for the growth and development of plants and their reproduction. Similarly, they help to control growth in diameter, pigmentation, and defence against various pathogens (Asensi *et al.,* 2011). Sterols plays an essential role in plant growth and development. In our study the *stimulatory effect of Ch. mural* at (1% and 5%) attributed to the present of plant sterols hormone (β – sitosterol). This supports the findings of Yokota and Takahashi (1985) that plant steroids showed strong growth-promoting effects in several plant species. Yasmeen *et al.* (2013) and Rehman *et al.* (2014) found that moringa leaf extract which contain plant hormones, causing enhancing in seed germination. Plant hormones such as stigmasterol (StS) plays an essential role in plant growth and development which occurs mostly in free or conjugated form and it is synthesized from β-sitosterol (Hashem *et al.,* 2011). sitosterol and stigmasterol play a regulatory function in plant development (He *et al.,* 2003). Application of stigmasterol enhanced the overall growth of *Zea mays* plants and improved the values of growth criteria of shoots and roots (Abdel-Wahed *et al.,* 2001). The application of stigmasterol enhanced the photosynthetic efficiency and enzyme activity in beans (Kalinich *et al.,* 1985). In addition, Abdel-Wahed (2001) found that the contents of the photosynthetic pigments chl a, chl b, and carotene were increased in maize as sitosterol concentration increased. In our study the phytotoxic activity of *Ch. mural* could be related to the presence of coumarin and its derivatives (3-(3,4-dimethoxyphenyl)-7-methyl-4-phenylcoumarin). These results added support to the results obtained by (Rizk 1986; Rizk *et al.*, 1986) who presented that the Chenopodium species contained alkaloids and coumarins. The ethyl acetate fraction of the crude extract of *Ch. murale* also displayed maximum inhibition (100%) of *L. aequinoctialis* at highest concentration (1000 µg ml^{-1}) (Bashir, 2003). On the other hand, lowest concentration tested (10 µg ml^{-1}) it promoted the growth of *Lemna acquinoctialis* by 26.66%. Chuah *et al.* (2013) showed a significant inhibition of germination, seedling growth and root/shoot growth of lettuce plant due to the phytotoxic of coumarins (7-prenyloxy coumarin, auraptene; <100 µg mL-1 concentrations). Coumarin is the main compound responsible for root growth inhibition as well as changes in histology and morphology of roots. Abenavoli *et al*. (2008) found that maize seedlings grew in a hydroponic culture for 6 days, and then added coumarin (at concentrations of 0, 25, 100, and 400 µM) to the nutrient solution, it led to inhibited root length and this reduction depending on root type. In addition, Imperatorin is a furanocoumarin and it is phytochemical caused significant inhibition on the growth of radicle and seedlings germination of *Amaranthus hypochondriacus*, *Echinochloa crus-galli*, *Lactuca sativa* and *Lycopersicum Esculentum* (Mata *et al.*, 1998).

Besides, coumarin derivatives obtained from *Stauranthus perforatus* caused significant inhibition for radicle growth of *A. hypochondriacus* and *E. crus-galli* (Anaya *et al.,* 2005). It was observed that, in lettuce plant, seed germination, shoot and root growth, were completely inhibited at concentration of auraptene and 7-prenyloxy coumarin higher than 100 µg m L^{-1} (Razavi *et al.,* 2010). On the other hand, aviprin, a- oxy prenylated furanocoumarin showed toxic effect on lettuce and completely suppressed the seed germination at 500 µg m L^{-1} (Razavi *et al.,* 2009). Shettel and Balke (1983) showed that umbelliferon significantly reduced the growth of some herbs like prosomillet, pigweed and velvetleaf. In our study the reduction in *Phaseolus vulgaris seedling* growth under high extract concentration of *B. muricate.* This reduction may be due to high concentration of allelochemical (phenolics) that result in hormonal growth imbalances, reduction of photosynthetic activities, lowering mineral and water uptake. These results are similar to that obtained by El-Khatib *et al.* (2004), where high concentration of extract containing phenolics and alkaloids might have lowered absorption of minerals and water and their translocation from roots to other plant parts with reduced photosynthesis. Allelochemicals have badly effects on the plants and they cause a biotic stress called allelopathic stress. Weir *et al.* (2004) and Singh *et al.* (2009) showed that, the crop productivity, vegetation pattern and growth were adversely influenced under the allelopathic stress condition. Many researches had previously reported that allelochemicals cause alternation in various cellular processes in plants viz. (Barkosky *et al.,* 2000), stomatal closure (Barkosky and Einhellig, 2003), water balance in plants (Galindo *et al.,* 1999) membrane permeability and respiration (Abrahim *et al.,* 2000).

Conclusion:

As a general from this study, the allelopathic effects of S.A.E.(shoot aqueous extract) of two wild plants *B.muricata* and *Ch. mural* at different concentration stimulated germination percentage and support tested morphological and physiological parameter of the *Phaseolus vulgaris* plants at (1% to 15% w/v) for *B. muricata* and (1% and 5% w/v) for *Ch. mural* , while the reduction was observed at (20 and 25% w/v) in *B. muricata* and the completely inhibition started from 10% for *Ch. Mural* extract . *We can conclude that* A.E. of two studied plant have both stimulatory and inhibitory effect *and this depend on the concentration of extract, so the lower concentration from two studied plant can use as growth regulators and high concentration can use as* eco-friendly" bio-herbicides for weed control.

Acknowledgment:

The authors would like to thank the Botany Department, Faculty of Science, Benha University for funding this study and for permitting us to carry out the experiment using their laboratory facilities.

REFERENCES:

Abdel-Wahed MSA. 2001. Sitosterol stimulation of root growth, yield and some biochemical constituents of maize. Mansoura Univ. J. Agric. Sci. Egypt, 26(5): 2563-2577.

Abenavoli MR, A. Lupini NA, S. Oliva S, Sorgonà A. 2008. Effects of different allelochemicals on root morphology of Arabidopsis thaliana. Allelopathy J., 22(1): 245-250.

Abrahim D, Braguini WL, Kelmer-Bracht AM, Ishii-Iwamoto EL. 2000. Effects of four monoterpenes on germination, primary root growth, and mitochondrial respiration of maize. J. Chem. Ecol., 26: 611-624.

Adedapo A, Jimoh F, Afolayan A. 2011. Comparison of the nutritive value and biological activities of the acetone, methanol and water extracts of the leaves of *Bidens pilosa* and *Chenopodium album*. Acta Pol. Pharm. Drug Res., 68(1): 83-92.

Al-Watban A, Salama HMH. 2012. Physiological effects of allelopathic activity of Artemisia monosperma on common bean (*Phaseolus vulgaris* L.). Int. Res. J. Plant Sci., 3(8): 158-163.

Al-Yahya MA, Al-Meshal IA, Mossa JS, Al-Badr A, Tariq M. 1990. Saudi plants, a phytochemical and biological approach. King Saud University Press. pp. 541.

Anaya AL, Macías-Rubalcava M, Cruz-Ortega R, García-Santana C, Sánchez-Monterrubio PN, Hernández-Bautista BE, Mata R. 2005. Allelochemicals from *Staurantus perforatus*, a Rutaceae tree of the Yuctan Pensula, Mexico. Phytochemistry, 66(4): 487-494.

Anonymous 1992. Handbook of Agriculture. Indian Council of Agricultural Research, New Delhi, pp. 744–759.

Arnon D. 1949. Copper enzymes in isolated chloroplasts polyphenoloxidase in *Beta vulgaris*. Plant Physiol., 24(1): 1-15.

Asensi M, Ortega A, Mena S, Feddi F, Estrela JM. 2011. Natural polyphenols in cancer therapy. Crit. Rev. Clin. Lab. Sci., 48(5-6): 197-216.

Barkosky RR, Einhellg FA. 2003. Allelopathic interference of plant–water relationships by para-hydroxybenzoic acid. Bot. Bull. Acad. Sin., 44: 53–58.

Barkosky RR, Einhellig FA, Butler JL. 2000. Caffeic acidinduced changes in plant-water relationships and photosynthesis in leafy

spurge *Euphorbia esula*. J. Chem. Ecol., 26: 2095-2109.

Bashir KA, Bawa JA, Mohammed I. 2014. Efficacy of leaf extract of drumstick tree (*Moringa oleifera* L.) on the growth of local tomato (*Lycopersicon esculentum*). J. Pharm. Biol. Sci., 9(4): 74-79.

Báthory M, Toth I, Szendrei K, Reisch J. 1982. Ecdysteroids in *Spinacia oleraceae* and Chenopodium *bonus-henricus.* Phytochemistry, 21(1): 236-238.

Batish DR, Lavanya K, Pal Singh H, Kohli R. 2007. Root-mediated allelopathic interference of nettle-leaved goosefoot (*Chenopodium murale*) on wheat (*Triticum aestivum*). J. Agron. Crop Sci., 193(1): 37–44.

Baziramakenga R, Simard RR, Leroux GD, Nadeau P. 1997. Allelopathic effects of phenolic acids on nucleic acid and protein levels in soybean seedlings. Can. J. Bot., 75(3): 445–450.

Benyase E, Hassanpouraghdam Mp, Zehtab SS, Khatamian OOS. 2010. Allelopathic effects of *Xanthium strumarium* L. shoot aqueous extract on germination seedling growth and chlorophyll content of lentil (*Lens culinaris* Medic.). Romanian Biotechnol. Lett., 15(3): 5223-5228.

Boulos L. 1983. Medicinal Plants of North Africa. Algonac, MI: Reference Pubns, pp. 286.

Bradford MM. 1976. A rapid sensitive method for the quantification of microgram quantities of protein utilizing the principle of protein-dye binding. Anal. Biochem., 72: 248-254.

Broughton WJ, Hernández G, Blair MW, Beebe SE, Gepts P, Vanderleyden J. 2003. Beans (*Phaseolus* spp.): model food legumes. Plant Soil, 252: 55-128.

Chuah TS, Tan PK, Ismail BS. 2013. Effects of adjuvants and soil microbes on the phytotoxic activity of coumarin in combination with p-vanillin on goosegrass (Eleusine indica L.) seedling emergence and growth. South Afr. J. Bot., 84: 128-33.

Clark JM, Switzer RL. 1977. Experimental Biochemistry, 2nd ed. W.H. Freeman Company, San Francisco, pp. 336.

El-Khatib AA, Hegazy AK, Galal HK. 2004. Does allelopathy have a role in the ecology of *Chenopodium murale*? Ann. Bot. Fennici, 41: 37-45.

Eltayeb AE, Kawano N, Badawi GH, Kaminaka H, Sanekata T, Shibahara T, Inanaga S, Tanaka K. 2007. Overexpression of monodehydroascorbate reductase in transgenic tobacco confers enhanced tolerance to ozone, salt and polyethylene glycol stresses. Planta, 225(5): 1255–1264.

Galindo JCG, Hernandez A, Dayan FE, Tellez MR, Macias FA, Paul RN, Duke SO. 1999. Dehydrozaluzanin C, a natural sesquiterpenolide, causes rapid plasma membrane leakage. Phytochemistry, 52(5): 805–813.

Guertin P. 2003. USGS weeds in the West. Project: Status of Introduced plants in Southern Arizona Parks, Fact Sheet for *Chenopodium murale* L.U.S. Geological survey/South west Biological Science Center Sanoran Desert field station, University of Arizona, Arizona.

Hashem HA, Bassuony FM, Hassanein RA, Baraka DM, Khalil RR. 2011. Stigmasterol seed treatment alleviates the drastic effect of NaCl and improves quality and yield in flax plants. Aust. J. Crop Sci., 5(13): 1858-1867.

He JX, Fujioka S, Li TC, Kang SG, Seto H, Takatsuto S, Yoshida S, Jang JC. 2003. Sterols regulate development and gene expression in Arabidopsis. Plant Physiol., 131(3): 1258-1269.

Holm L, Pancho J, Herberger V, James P, Plucknett DL. 1979. A geographical atlas of world weeds. John Wiley and Sons, New York. pp. 391.

Iqbal A, Khalil IA, Ateeq N, Khan MS. 2006. Nutritional quality of important food legumes. Food Chem., 97(2): 331–335.

Kalinich JF, Mandava NB, Todhunter JH. 1985. Relationship of nucleic acid metabolism to brassinolide induced response in beans. J. Plant Physiol., 120(3): 207-214.

Kamel MS, Mohamed KM, Hassanean HA, Ohtani K, Kasai R, Yamasaki K. 2001. Acylated flavonoid glycosides from *Bassia muricata*. Phytochemistry, 57(8): 1259-1262.

Keskitalo M. 2003. Crop plants as a source of biomolecules:The effect of fertilization on the production of phenolic compounds. In: Proceedings of the NJF's 22nd Congress "Nordic Agriculture in Global Prespective" (Turku, Finland, 1–4 July 2003). [Cited 2008.] Available from URL: http://www.Nif.dk/nif/reports/nifreports.htm.

Khalil R, Yusuf M, Bassuony F, Gamal A, Madany M. 2020. Phytotoxic effect of *Alhagi maurorum* on the growth and physiological activities of *Pisum sativum* L. South Afr. J. Bot., 131: 250-258

Madany MMY, Khalil RR. 2017. Fenugreek seed extract enhanced the growth of *Vicia faba* and *Zea mays* seedlings. Egypt. J. Bot., 57(2): 363-377.

Mata R, Macías ML, Rojas IS, Lotina-Hennsen B, Toscano RA, Anaya AL. 1998. Phytotoxic compounds from Esenbeckia yaxhoob. Phytochemistry, 49(2): 441-449.

Metzner H, Rau H, Senger H. 1965. Untersuchungen zur Synchronisierbarkeit einzelner Pigmentmangel-Mutanten von *Chlorella*. Planta, 65: 186–194.

Momtaz MH, Hamada RG. 2010. Antioxidative effects of acetone fraction and vanillic acid from *Chenopodium murale* L. on tomato plant. Weed Biol. Manag., 10(1): 64-72.

Muhammad AI. 2015. Improving germination and seedling vigour of cowpea (*Vigna unguiculata* L.) with different priming techniques. American-Eurasian J. Agric. Environ. Sci., 15(2): 265-270.

Oueslati O. 2003. Allelopathy in two durum wheat (*Triticum durum* L.) varieties. Agr. Ecosyst. Environ., 96(1): 161-163.

Parimelazhagan T, Francis K. 1999. Antifungal activity of *Clerodendrum viscosum* against *Curvularia lunata* in rice seeds. J. Mycol. Plant Pathol., 29(1): 139-141.

Razavi SM, Ghasemiyan A, Salehi S, Zahri F. 2009. Screening of biological activity of *Zosima absinthifolia* fruits extracts. Eur. Asia. J. Biosci., 4: 25-28.

Razavi SM, Zarrini G, Zahri S, Mohammadi S. 2010. Biological activity of *Prangos uloptera* DC. roots, a medicinal plant from Iran. Nat. Prod. Res., 24(9): 797-803.

Rehman H, Nawaz MQ, Basra SMA, Afzal I, Yasmeen A, Hassan FU. 2014. Seed priming influence on early crop growth, phenological development and yield performance of linola (*Linum usitatissimum* L.). J. Integr. Agr., 13(5): 990-996.

Reigosa MJ, Souto XC, Gonz´lez L. 1999. Effect of phenolic compounds on the germination of six weeds species. Plant Growth Regul., 28: 83–88.

Rizk AM, Heiba HI, Ma'Ayergi HA, Batanouny KH. 1986. Constituents of plants growing in Qatar. Fitoterapia 57: 3–9.

Rizk AM. 1986. The Phytochemistry of Flora of Qatar. 1986. Doha, State of Qatar: Scientific and Applied Research Centre, University of Qatar, pp. 582.

Saleh AM. 2013. In vitro assessment of allelopathic potential of olive processing waste on maize (*Zea mays* L.). Egypt. J. Exp. Biol., 9(1): 35-39.

Shaker K, Al Jubiri S, El-Hady F, Al-Sehemi A. 2013. New compounds from *Bassia muricata* and *Fagonia indica*. Int. Pharm. Sci. Rev. Res., 23(1): 231-236.

Shaltout KH, El-Ghareeb R. 1992. Diversity of the salt marsh plant communities in the western Mediterranean region of Egypt. J. Univ. Kuwait (Sci.), 19: 75–84.

Shettel NL, Blake NE. 1983. Plant growth response to several allelopathic chemicals. Weed Sci., 31(3): 293-298.

Siddiqui S, Bhardwaj S, Saeed S, Meghvanshi MK. 2009. Allelopathic effect of different concentration of water extract of *Prosopsis juliflora* leaf on seed germination and radicle length of wheat (*Triticum aestivum* Var-Lok-1). Am. Eurasian J. Sci. Res., 4(2): 81-84.

Signaboubo S, Noumbo GT, Aoudou Y, Fovo D, Kamdoum EK. 2015. Efficacy of three local plant extracts as seed treatment on the germination, infection and vigour index of two cotton seed varieties from Chad. IJABPT, 6(2): 39-44.

Singh A, Singh D, Singh NB 2009. Allelochemical stress produced by aqueous leachate of *Nicotiana plumbaginifolia* Viv. Plant Growth Regul., 58: 163-171.

Soltanipour MA, Moradshahi A, Khold BB, Barazandeh MM, Rezaei MB. 2006. Allelopathic effectcts of essential oils of *Zhumeria majdae* on Wheat (*Triticum aestivum*) and Tomato (*Lycopersicon esculentum*). Iran. J. Biol., 19(1): 19-28.

Tackholm V. 1974. Students Flora of Egypt, 2nd ed. Cooperative Printing Co, Beirut, pp. 466.

Tnveer A, Tahir M, Nadeem MA, Younis M, Aziz A, Yaseen M. 2008. Allelopathic effects of *Xanthium strumarium* L. on seed germination and seedling growth of crops Allelopathy J., 21(2): 317-328.

Varadarajan K, Prakasa Rao JS. 2002. Effect of ethereal on seed germination and seedling growth of different genotypes of blackgram (*Vigna mungo* (L.) (Hepper) under stimulated moisture stress. Indian J. Plant Physiol., 7(3): 295-297.

Vasishita PC. 1989. Taxonomy of Angiosperms. India: Ram Chand. pp. 648.

Weir TL, Park SW, Vivanco JM. 2004. Biological and physiological mechanisms mediated by allelochemicals. Curr. Opin. Plant Biol., 7(4): 472-479.

Yasmeen A, Basra SMA, Farooq M, Rehman H, Hussain N. Athar HR. 2013. Exogenous application of moringa leaf extract modulates the antioxidant enzyme system to improve wheat performance under saline conditions. Plant Growth Regul., 69: 225-233.

Yokota T, Takahashi N. 1986. Chemistry, physiology and agricultural application of brassinolide and related steroids. In: "Plant Growth Substances 1985. (Bopp M. ed)". Proceedings in Life Sciences. Springer, Berlin, Heidelberg, pp. 129-139.

فعالية المستخلصات النباتية لجنسين من عائلة Chenopodiaceae على إنبات ونمو بادرات الفاصوليا

ريهام محمد مصطفي، هبة سامي عيسوي

قسم النبات والميكروبيولوجي، كلية العلوم، جامعه بنها، مصر

أجريت هذه الدراسة لفحص الإمكانية الأليلوباثية للمستخلصات المائية لنبتتين بريين باسيا موريكاتا وكينوبوديوم مورال بتركيزات مختلفة (1، 5، 10، 15، 20، 25٪ وزن / حجم) بالإضافة إلى 0٪ (ماء الصنبور) كعينة غير معاملة، على إنبات البذور ونمو البادرات والكلوروفيل ومحتوى البروتين والسكر لنبات الفاصوليا. كشف تحليل الطيف الكتلي اللوني للغاز (GC.MS) عن وجود 33 مركبًا حيويًا للكينوبوديوم مورال و 31 مركبًا للباسيا موريكاتا وهذا التحليل أظهر وجود العديد من المركبات مثل الأحماض الدهنية والهيدروكربونات الأليفاتية والبوليفينول والستيرودات. وأشارت النتائج المتحصل عليها إلى أن نقع بذور الفاصوليا لمدة 24 ساعة في المستخلص المائي للمجموع الخضري لكل من الباسيا موريكاتا والكينوبوديوم مورال بتركيز (1٪ إلى 15٪)؛ (1٪ و5٪) على التوالي حفزت نسبة الإنبات ودعمت جميع المتغيرات المورفولوجية والفسيولوجية محل الدراسة لنبات الفاصوليا. بينما لوحظ الانخفاض في القياسات محل الدراسة عند (20 و25٪ وزن / حجم) للباسيا موريكاتا والتثبيط التام للكينوبوديوم مورال الذي بدأ ظهوره من تركيز10٪ بالمقارنة بالنبات الغير معالج وقد يكون التأثير المحفز لكل من النباتات البرية مرتبطًا بوجود مركبات البوليفينول والهرمونات الستيرويدية وفقًا للتركيز. ويرجع احتمالية النشاط السام لنبات الكينوبوديوم مورال (التثبيط الكامل) إلى وجود الكومارين ومشتقاته على سبيل المثال مركب (3- (3،4-ثنائي ميثوكسيفينيل -7-ميثيل-4-فينيل كومارين) الموجود في مستخلص نبات الكينوبوديم مورال.