DOI : 10.35124/bca.2019.19.S1.2549

Biochem. Cell. Arch. Vol. 19, Supplement 1, pp. 2549-2554, 2019 | www.connectjournals.com/bca | *ISSN 0972-5075*

EFFECT OF DRY YEAST AND LICORICE SPRAY ON GROWTH AND YIELD OF LOCAL CULTIVAR MUNG BEAN

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(Received 19 March 2019, Revised 18 May 2019, Accepted 27 May 2019)

ABSTRACT : A field experiment was conducted during spring season of 2016 in Al- Zidan district,Abu-Graib,Baghdad to study the effect of spraying three concentrations of dry yeast (0,5 and 10 g.L^{-1}) and three concentrations of licorice (0, 5 and 10 g.L^{-1}) on the growth and yield of the local cultivar of mung bean (*Vigna radiate*). A factorial experiment was done according to R.B.C.D with three replicates. The first factor was the concentrations of the dry yeast and the second was the three concentrations of licorice extract. The results show High concentrations of yeast and licorice extracts were superior for most studied traits, since 10 g.L^{-1}of yeast extract achieved the highest mean ofplant height, number ofbranches, pod length, number ofpods (32.2 pods plant^{-1}) number of seeds perpod (9.4 seeds pod^{-1}) and seed yield (1078,9 kg ha^{-1}) the highest concentration of licorice extract achieved highest number of branches, leaf area, pod length, number of pods (30.7 pods plant^{-1}), number of seeds perpod (8.7 seeds pod^{-1}) and seed yield (1076,7 kg ha^{-1}). Interaction between yeast and licorice extracts concentrations significantly affected most studied traits. Plants sprayed with the highest concentrations of yeast and licorice showed the highest mean of leaf area, number of pods per plant, number of seeds per pod, pod length and seed yield for unit area while plants of control recorded lowest means of aforementioned traits.

Key words : Mung bean, dry yeast, growth and yield, licorice spray.

INTRODUCTION

Mung bean (*Vigna radiate* L.) is one of pulse crops which cultivated in wide range in middle and southern districts in Iraq. It is characterized with short growing season and tolerance of dry circumstances (Al-Noaimi *et al*, 1991). Its plants and seeds used for animal feeding because of the high contents of protein, carbohydrate, oil and fibers (Al-Yonus, 1993). In spite of the importance of this crop, the mean productivity is still down the expected values as compared with global production. From the mentioned above, it is necessary to improve the cultivation of this crop in order to achieve qualitative and quantitative development in its productivity. This situation must be known to ensure good performance and high productivity of plants. One of these operations is use of modern technologies like bio nutrition and use of growth regulators that have great roles in plant growth. Previous studies showed the possibility of using biofertilizers and plant extracts to minimize chemical fertilizer use for plant nutrition (Sabry *et al*, 2009; Saleh *et al*, 2006). These extracts are considered as a chemical, biological and agricultural tool which may be used by the plant for appearing its physiological and genetic abilities to the highest level efficiently. Dry baker yeats extract is one of these materials which used as biofertilizer sprayed on the vegetative parts for nutrition. It has an important role in increase growth and yield since it helps in carbohydrate accumulation and encourages division and elongation of stem cells and synthesis of protein, nucleic acids and chlorophyll. In addition yeast extract is available, cheap in price, easy in use and does not cause pollution for environment and recovered many nutrients and some amino acids (Khedr and Farid, 2000; El-Desouky *et al*, 2007). Licorice extract has an important role in growth, flowering and yield improvement when added to the plant because it contains sugars, proteins and some minerals (Mosa *et al*, 1999). Furthermore, it has a behavior similar to gibbrellin in catalysis of germination velocity and helping in cell division and elongation leading to increase the volume of vegetative part and improve growth traits and yield (Al-Jowary, 2002). According to what mentioned above this research was done to study the response of the local cultivar of mung bean to spray with yeast and licorice extracts since these materials have no harmful effect on human, animal and environment. In addition, they give the plant its requirements from some important nutrients, which directly and indirectly take part in qualitative and quantitative improvement of growth and

yield traits.

MATERIALS AND METHODS

A field experiment was carried out during spring season of 2016 in Al-Zidan district Abu–Ghraib, Baghdad in order study the effect of the foliar application with three concentrations of dry baker yeast extract (0, 5 and 10 $g.L^{-1}$) and three concentrations of licorice extract (0,5 and10$g.L^{-1}$) on growth and yield of local cultivar of mung bean.

Factorial experiment was applied according to randomized complete block design (R.C.B.D.) with three replicates the experiment included two factors, the first factor was the three concentrations of dry baker yeast extract and the second factor was the three concentrations of licorice extract. Dry baker yeast extract was prepared by dissolving certain weights (5 and 10 g) of baker yeast (from Turkish origin) in one liter of warm distilled water. Sugar was added in a ratio of(1:1)to activate the yeast. The mixture was kept in an incubator at 25º c for two hours (Chalutz *et al*, 1977). Licorice extract was prepared by washinglicorice roots with water, cutting into small pieces drying them at 65ºC till stable weight reached milling and sieving. Fine powder was used for preparation of required concentrations by dissolving (5 and 10 g) in one liter of distilled water for each and holding in incubator at 30ºC for 24 hours. Then, the solution was filtered with two pieces of cloth to obtain the required concentrations (Al-Marsoomi, 1999). Those extracts were sprayed on the vegetative partsof mung bean plants in two batches in early morning during vegetative growth and flower initiation stages. A detergent was used as dispersing material in a concentration of (0.15 $cm^3.L^{-1}$) to increase the absorption efficiency and decrease the surface tension of water and make complete wetting of the vegetative part of plant (Abu Dahi *et al*, 2009). Control plant was sprayed with distilled water only.Good practices (cultivation, disking and leveling) were done. Then, it was divided into experimental units (3×1.8m) with an area of $5.4m^2$ cultivation in rows was followed. The experiment unit contained five was with a distance of 30 cm between rows and 25 cm between plants and 1 m was left between the experimental units to ensure that interaction between spray treatments would not be happened. Planting was done by hand at 1/4/2016. First irrigation was directly applied after planting. Then irrigation was repeated according to soil humidity and plant condition. Experimental field was fertilized with phosphate (P_2O_5 46%) at level of 75 kg P. ha^{-1} in one batch at seeding nitrogen fertilizer was added as urea(N 46%) at a level of 40 kg N ha^{-1} in two batches, the first was at seeding and the second was at flowering of all treatments (Ali, 2012) and were done as required during growth season.

Ten plants were randomly chosen from the middle lines to study the following traits; plant height, number of branches, leaf area, number of pods, pod length, number of seeds per pod and total seed yield.Data were statistically analyzed according to analysis of variance(ANOVA) method with R.C.B.D. using Genstat software. Least significant difference (L.S.D) at the probability level of 5% was used to compare the mean values of traits under study (Steel and Torrie, 1980).

RESULTS AND DISCUSSION

Plant height (cm)

Results in Table 1 shows no significant effect of licorice extract and the interaction between the two factors of study on this trait. From Table 1, a significant increase can be noticed in mean plant highest concentration of yeast extract (10 $g.L^{-1}$) and it achieved the highest mean plant height (53.14cm) with a significant increase of 19.82% over control, which achieved the least mean plant height (44.35 cm). This superiority may ascribed to dry yeast which is considered as a natural source of cytokinins that have an important role in cell division, differentiation and increasing in size in addition cytokinins help ribonucleic in growth rates and hence elongation and increase acids and protein synthesis leading to increase growth rates, elongation and plant height (Fathy and Farid, 1996). This result was agreed with Al-Obaidy (2017), who found a significant effect of dry yeast extract on plant height.

Number of branches per plant

It was clear from table (2) that the highest concentration of yeast extract (10 $g.L^{-1}$) achieved the highest mean of branches number (5.4 branches $plant^{-1}$), which was not significantly differed from the other concentration (5 $g.L^{-1}$), which achieved 5.1 branches $plant^{-1}$, but both of them were significantly differed from control which had the lowest mean (4.5 branches $plant^{-1}$) for this trait this may be due to that yeast extract contains many macro- and micronutrients, like nitrogen which entered in the structure of amino acids, the basic units in proteins and enzymes this would positively reflected in plant growth and hence increase branches number per plant (Nagoda, 1991). This agrees with the results of Ghalib *et al* (2013), Al-sahaf *et al* (2017), Nassar *et al* (2011), which found a significant effect of this extract on stem number results of the same table revealed that spray with licorice extract (10 $g.L^{-1}$) gave the highest mean of branches number per plant (5.8 branches $plant^{-1}$), which was significantly different from the other mean value (4.3 branches $plant^{-1}$) for this trait this superiority of the highest concentration of licorice extract may be ascribed to

occurrence of the biosynthetic precursors of gibberellin and elongation and hence leading to increase vegetative growth and increase in stem number in plant (Al-Darwash 1975). The interaction between the two factors under study had no significant effect on stems number per plant (Table 2).

Leaf area (dm^2)

It can be seen from Table 3 that the plants sprayed with yeast extract (5 $g.L^{-1}$) had the highest leaf area (16.5 dm^2. $plant^{-1}$) and not significantly differed from the plants sprayed with the highest concentration of yeast extract (16.4 dm^2 $plant^{-1}$). Both of them had significant differences over control (11.1 dm^2plant^{-1}) the cause behind this superiority may be due to the significant effect of dry yeast extract on both plant height and number of stems (Tables 1 and 2). This is positively reflected in increase leaf area of the plant this result was in line with the results of other studies found a significant effect of yeast extract on leaf area (Al-Robaiai, 2014; Al-Obaidy, 2017). Results of Table 3 also showed increases in mean values of plant leaf area with increase in licorice extract concentrations the highest mean values for this trait (16.7 dm^2.$Plant^{-1}$) was obtained from plants sprayed with the highest concentration of licorice extract but it was insignificantly differed from plants sprayed with (5$g.L^{-1}$) of licorice extract (15.6 dm^2 $plant^{-1}$). Both of them were significantly differed from control plants which achieved the lowest value of leaf area (11.6 dm2. $plant^{-1}$).The reason behind this superiority may be due to the gibberellin like behavior of same materials in this extract in induction of vegetative growth of dormant buds and increase elongation and division of cells from the other hand this will give vegetative growth enough to increase plant leaf area (Abd Alqadir *et al*, 1982). The two way interaction between dry yeast and licorice extracts was significantly affected in this trait (Table 3). Plants sprayed with (5 $g.L^{-1}$) of dry yeast extract revealed the highest mean value (19.4 dm^2 $plant^{-1}$) for this trait and it was not significantly different from plants sprayed with the highest concentrations of yeast and liquor rice extracts whereas control plants gave the lowest mean value (9.9 dm^2.$plant^{-1}$).

Pods number per plant

Results of Table 4 indicated that plants sprayed with the highest concentration of yeast extract was significantly better than other treatments and gave highest mean value for this trait (32.2 pods.$Plant^{-1}$) whereas plants sprayed with 5 $g.L^{-1}$ and control plants achieved least mean values for this trait (27.5 and 27.8 pods $plant^{-1}$ respectively). This may be attributed to yeast extracts contents from various metal elements and amino acids necessary for enhancing the efficiency of photosynthesis and this could be positively reflected on activation of growth stages and flower formation and hence increase pods number per plant (Eata *et al*, 2001). This result is in agreement with Al-Obaidy (2017), Al-Hamdani and Al-Jobori (2014), who found a significant effect of yeast extract on pods number in various field crops. It was noticed from Table 4 that plants sprayed with 10 $g.L^{-1}$ of licorice extracts showed the highest mean value of pods number per plant (30.7 pods $plant^{-1}$) with significant increases of 12.5 and 4.4% over plants sprayed with 5 $g.L^{-1}$ and control, which gave lowest mean values for this trait (27.3 and 29.4 pods $plant^{-1}$, respectively) the superiority in most growth traits like number of branches and leaf area (Tables 3 and 4) and this was reflected in increase pods number per plant. The interaction between the studied factors was significantly affected in pods number per plant (Table 4). Plants sprayed with the highest concentration of dry yeast and licorice extracts gave the highest mean value for this trait (32.9 pods $plant^{-1}$). While the control plants gave the lowest mean value for pods number per plant (27.2 pods $plant^{-1}$).

Number of seeds per pod

Table 5 revealed that plants sprayed with 10 $g.L^{-1}$ of dry yeast extract was the best over other treatments as it had the highest mean value of seeds number per pod (9.4 seeds) with significant increases of 44.6 and 22.1% over control and plants of 5$g.L^{-1}$ treatment, respectively. This was due to availability of nutrients in dry yeast extract which was reflected in improvement of plants performance in biological activities, especially photosynthesis and increase of materials metabolized in the source and their movement to the sink leading to increase seeds number per pod. Results of Table 5 also showed that plants which sprayed with the high concentration of licorice extract achieved highest mean value for this trait (8.7 seeds). This treatment was significantly different from other treatments whereas plants of control showed the least mean value for this trait (6.9 seeds) the reason behind the superiority of the highest licorice extract concentration in this trait may be due to its superiority in most studied traits like number of branches , leaf area, number of pods and pod length (Tables 2, 3, 4 and 6, respectively) and hence increase plant, ability to redistributed the products of photosynthesis in the form of increasing pods fertility and decreasing seeds abortion and this would increase number of seeds per pod. From the results of interaction between the effects of dry yeast and licorice extracts (Table 5), it is clear that the highest mean of seeds number per pod was achieved by the spray with the highest concentrations of both extracts (9.8 seeds. $pods^{-1}$). While

Table 1 : Effect of spray with dry yeast and licorice extract and their interaction in plant height (cm).

Concentrates of dry yeast extract g.l^{-1}	Concentrates of licorice extract g.l^{-1}			Mean of dry yeast extract concentrations
	0	5	10	
0	44.25	44.45	44.34	44.35
5	48.27	48.61	48.33	48.40
10	53.26	53.56	52.61	53.14
Mean of licorice extract concentrations	48.60	48.88	48.43	LSD 5%
Licorice × dry yeast		Licorice	dry yeast	
N.S		N.S	0.67	

Table 2 : Effect of spray with dry yeast and licorice extract and their interaction in number of branches.

Concentrates of dry yeast extract g.l^{-1}	Concentrates of licorice extract g.l^{-1}			Mean of dry yeast extract concentrations
	0	5	10	
0	3.9	4.6	5.2	4.5
5	4.4	4.9	5.9	5.1
10	4.7	5.3	6.3	5.4
Mean of licorice extract concentrations	4.3	4.9	5.8	LSD 5%
Licorice × dry yeast		Licorice	dry yeast	
N.S		0.37	0.37	

Table 3 : Effect of spray with dry yeast and licorice extract and their interaction in Leaf area (dm^2).

Concentrates of dry yeast extract g.l^{-1}	Concentrates of licorice extract g.l^{-1}			Mean of dry yeast extract concentrations
	0	5	10	
0	9.9	11.2	12.1	11.1
5	11.6	18.5	19.4	16.5
10	13.4	17.1	18.7	16.4
Mean of licorice extract concentrations	11.6	15.6	16.7	LSD 5%
Licorice × dry yeast		Licorice	dry yeast	
2.2		1.3	1.3	

plants of control gave the lowest mean for this trait (5.2 seeds.pod^{-1}).

Pod length (cm)

Results of Table 6 showed increases in pod length mean values with concentrations of dry yeast extract. Thehigh concentration of yeast extract achieved the highest mean value for this trait 8.6cm, whereas control showed lowest value 5.5cm. The superiority of dry yeast extract in most growth traits beside its content of many nutrients led to provide the initiated pods with requirements

Table 4 : Effect of spray with dry yeast and licorice extract and their interaction in pods plant^{-1}.

Concentrates of dry yeast extract g.l^{-1}	Concentrates of licorice extract g.l^{-1}			Mean of dry yeast extract concentrations
	0	5	10	
0	27.2	27.5	28.6	27.8
5	29.2	22.7	30.6	27.5
10	31.9	31.9	32.9	32.2
Mean of licorice extract concentrations	29.4	27.3	30.7	LSD 5%
Licorice × dry yeast		Licorice	dry yeast	
3.4		2	2	

Table 5 : Effect of spray with dry yeast and licorice extract and their interaction in seeds.pod^{-1}.

Concentrates of dry yeast extract g.l^{-1}	Concentrates of licorice extract g.l^{-1}			Mean of dry yeast extract concentrations
	0	5	10	
0	5.2	6.7	7.8	6.5
5	6.2	8.5	8.4	7.7
10	8.7	9.6	9.8	9.4
Mean of licorice extract concentrations	6.9	8.2	8.7	LSD 5%
Licorice × dry yeast		Licorice	Dry yeast	
0.22		0.12	0.12	

necessary for increasing cell division and elongation, and this reflected in increasing pod length. Results of Table 6 also showed significant differences among concentrations of licorice extract in this trait. Plants sprayed with the highest concentration of licorice extract gave the highest mean value 7.9cm for pod length, while control plants gave the lowest mean value for this trait (6.3). This increase may be due to licorice extract contents of gibberellin precursor, which caused cell elongation, growth and enlargement and hence increasing in pod lengths of the plant. As for the two way interaction between study factors, it revealed a significant effect on this trait (Table 6). Plants sprayed with the highest concentration of yeast and licorice extracts gave the highest mean value for pod length 9.2 cm, whereas control plants for the two factors gave the lowest value 5.2cm.

Seed yield (Kg ha^{-1})

Results in Table 7 refer to significant increases in seed yield per unit of area with concentrations of dry yeast extract. The concentration 10 gL^{-1} showed the highest mean value for this trait (1078.9 Kgha^{-1}) and it was significantly different from other treatments. Control achieved the least seed yield (685.6 Kg. ha^{-1}). The

Table 6 : Effect of spray with dry yeast and licorice extract and their interaction in pod length (cm).

Concentrates of dry yeast extract g.l^{-1}	Concentrates of licorice extract g.l^{-1}			Mean of dry yeast extract concentrations
	0	5	10	
0	5.2	5.6	5.6	5.5
5	6.3	7.7	8.8	7.6
10	7.4	9.1	9.2	8.6
Mean of licorice extract concentrations	6.3	7.5	7.9	LSD 5%
Licorice × dry yeast		Licorice	Dry yeast	
0.46		0.27	0.27	

Table 7 : Effect of spray with dry yeast and licorice extract and their interaction in Seed yield (Kg.ha^{-1}).

Concentrates of dry yeast extract g.l^{-1}	Concentrates of licorice extract g.l^{-1}			Mean of dry yeast extract concentrations
	0	5	10	
0	520	753.3	783.3	685.6
5	683.3	806.7	1203.3	897.8
10	790	1203.3	1243.3	1078.9
Mean of licorice extract concentrations	664.4	921.1	1076.7	LSD 5%
Licorice × dry yeast		Licorice	Dry yeast	
76.4		44.1	44.1	

superiority of the high concentration of dry yeast extract in this trait may be due to its significant superiority in yield components (Tables 4 and 5) and all this waspositively reflectedon increase seed yield in unit area. In this criterion many authors noticed significant increase in seed yield of various field crops when dry yeast extract was used (El-Tohamy *et al*, 2008; Sead and Abido, 2014; Nabila *et al*, 2017). Also seed yield was increased with concentration of licorice extract (Table 7). The highest seed yield (1076.7 Kg. ha^{-1}) was obtained in treatment (10 g.L^{-1}) with a significant increase amounted to 155.6 Kg and 412.3 Kg over treatment (5 g.L^{-1}) and control, respectively. This increase came from the superiority of the highest concentration of licorice extract in pods number,seed number in pod and pod length (Tables 4, 5 and 6, respectively). Significance of interaction between the two factors under study which is showed in Table 7 revealed that the plants sprayed with the highest concentrations from yeast and licorice extracts recorded highest mean value for seed yield 1243.3 Kg.ha^{-1} comparing with other interactions treatments in which control of both extracts recorded least mean value for seed yield 520 Kgha^{-1}.

CONCLUSION

Present study conclude from this study that the biological nutrition has shown a significant effect in most of the traits studied in this research, where the high concentrations of the yeast extract and licorice the highest mean for most of the characteristics of growth and yield of plant mung bean.

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