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EFFECT OF SPRAYING NUTRIENTS ON THE CHARACTERISTICS OF THE WHEAT SEEDS (*TRITICUM AESTIVUM* L) OF THE BASIS OF THE LOCAL C.V. BABIL 113.

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Abstract

A field experiment was conducted during the winter season 2017-2018 to evaluate the effects of some chemical nutrients spraying on the growth, yield and characteristics of the wheat seeds (*Triticum aestivum* L) of the basis of the local c.v. Babil 113. The experiment was carried out according to the RCBD design with four replicates. The experimental unit area (1.5 m × 3 m). Nuclear seeds of bread wheat of the local cultivar Babel 113 planted in 19/12/2017 with seedling rate (120 kg ha^{-1}). Nine treatments for nutrients spraying (in the stages of booting and anthesis), which was (urea sprayed at a concentration 6.75 g L^{-1}, potassium nitrate sprayed at a concentration of 6.75 g L^{-1}, potassium chloride sprayed at a concentration of 6.75 g L^{-1}, potassium sulfate sprayed at a concentration of 6.75 g L^{-1}, zinc nitrate sprayed at a concentration of 100 mg L^{-1}, zinc chloride sprayed at a concentration of 100 mg L^{-1}, humic acid sprayed at a concentration of 22.5 mg L^{-1}, a mixture trace elements sprayed at a concentration of 90 mg L^{-1} and the treatment of spraying only water that treated as treatment of control).

The results indicated that the spraying of urea gave the highest medium of the traits (tertrazolium, initial count of the standard germination, initial count of germination under aging, number of leaves and number of seedling tillers). The highest medium of percentage of medium-sized seeds and length of coleoptile was obtained under foliar spray of potassium nitrate. The highest mean of the percentage of small-sized seeds (2.75%) was obtained under potassium chloride, while foliar spraying with potassium sulphate gave the highest medium of the traits (seedling vigor indicator, radical length, seedling length, percentage and speed of the field emergence and the field establishment of the seedling. Spraying of zinc nitrate gave the highest medium of percentage of large-size seeds and dry weight of the seedling). Spraying with the mixture of micronutrients gave the highest mean in percentage of cold germination and dry weight of the plants. Some traits were not affected by the foliar spray of nutrients. The comparison treatment (spraying with water only) gave the highest mean values of the final count of standard germination, the final count of germination under aging, the germination vigor indicator and the percentage of field emergence). We conclude from this study that foliar spraying with nutrients in the stages of the booting and anthesis contributed in improving the quality, vitality and vigor of the seeds of the Babel 113 wheat crop. Foliar application with nutrients containing potassium compounds. Foliar spraying has also contributed to improved seedling indicators in field and laboratory tests.

Key words : *Triticum aestivum,* Foliar spraying, nutrients.

Introduction

Seed is deemed basic unit of reproduction of floral species and considered economic part of crops. The seeds are the gift of nature and the main entrance and most important and cheapest to enhance and stabilize the productivity and revenues per unit area and for any crop since agriculture became a regular profession in existence (Bhaskran *et al*., 2005). Most plants propagate by seeds which are considered important in the living world and in the universe (AL-Maeini, 2015). The seed is the main link between two generations of plants of any species in which genetic traits are translocate from generation to generation (Amin and Abbas, 1988). The main biological function for maintaining seeds is to ensure survival and spread plant species within the appropriate environmental geographical range (Bareke, 2018). Seed production is one of the most profitable activities in agriculture (Milosevic *et al*., 2010). Environmental and commercial conditions and availability of material and human inputs determine whether the country will succeed in developing seed production for crops and vegetables (Malisevec, 2004 and Milosevic).

The stage of field establishment is the most important among the stages of plant growth, because the subsequent stages depend on it due to integration of the number of reproductive plants in the unit area is the foundation to establishment that depends on the characteristics of the seeds, (AL-Maeini and Al-ubaidi, 2018). Therefore, high quality seed is key factor to succeed of any crop because it will give high germination and growth ratio which could lead into healthy seedlings and eventually homogeneous plants with appropriate growth are established (Egli, 1998). Seed size play an important and central role in germination, field establishment as well growth and increase plant biomass (Singh and Kailasanathan, 1976).

There are several internal or external factors could affect quality and vitality of seeds. These may occur during different stages of plant growth pre-harvest process which may interacts with each other such as soil fertility, nutrients availability, water, temperature, light, seed location, plant growth, insect and fungal infections and biomass efficiency in intercepting sun light and convert it into dry matter and efficiency of vessels in translocation nutrients to seeds (Gastel, 1996). High temperature during seeds development causes the forced maturity of some plant which can produces small seeds, lack water availability in and out of the plant at inappropriate times during maturity. Lower temperature over the optimal during seed formation lead to delay and reduction in growth rate, seed germination, seed vitality (AL-Khafaji, 2008). There is a high self-correlation between solar radiation and temperature (Dhillon, 1993). Water scarcity has a negative effects by increasing likelihood of flowers abortion or reducing number of seeds as well as its effect on the absorption and transfer of dry matter towards seeds (Saint *et al*., 2008). Increase seed size is related to enhancement of seed growth rate during the filling stage due to availability of required nutrients within the plant and occurrence of any deficiency in its availability could be compensated quickly and effectively by spraying it on the vegetative parts at different stages of growth according to scientific recommendations (Curley, 1994). Foliar fertilization ensures availability of nutrients for the crop which enables it to complete its life cycle naturally to obtain a higher product quality and quantity (Arif *et al*., 2006). Furthermore, foliar fertilization of nutrients may enhance role of the roots by absorbing the same nutrients added to the soil or other nutrients by improving root growth and increase nutrient uptake and may increase building of chlorophyll in the leaves (Oosterhuis, 1998) plant response to environmental stress is through its nutritional statues. Pettregrew, (2008), by studying the effect of potassium on the yield and quality of wheat, maize, basalia and cotton seeds found that potassium is one of the most important nutrients for yield production and quality by enhancing many physiological processes as well as it's effect on water relations, photosynthesis, translocation and enzyme activation that could have direct impact on crop productivity. Furthermore, foliar application of zinc, iron and manganese could significantly increases crop productivity (Wissuma *et al*., 2008). Application of micronutrients such as zinc and iron can decrease plant susceptibility to drought stress (Sultana *et al*., 2001). In addition to this, Fan *et al.,* (2005) found that both leaf photosynthesis and accumulation of grain starch could be enhanced by providing nitrogen under drought conditions and post-anthesis nitrogen supply increased cereal yields significantly (Madani, 2010).

The seeds in Iraq are exposed to hard conditions in the stage of seeds filling such as high temperatures, hot winds and low relative humidity with increase competition between the seeds of each spike or single spike which affects characteristics of the seed quantity and quality. This study aimed to determine the effect of foliar application of some chemical nutrients on the qualitative characteristics (laboratory and field) of basis seeds of the Babil bread cultivar (113) under conditions of Middle region of Iraq.

Materials and Methods

A field experiment was conducted during the winter season 2017-2018 at the research station of Al-muradiya of the Directorate of Agriculture of Babylon, 12 km southwest of Hilla city center / Babylon governorate, which is located on latitude (32˚.30¯N) and longitude (44˚.39¯E) to figure out the impact of foliar application on characteristics of seeds of the nucleus rank to produce seeds of basis level of bread wheat (*Triticum aestivum* L.) local cultivar (Babel 113) in mixture silty clay soil which some of its properties are shown in table 1.

Wheat seed were planting in rows in 19/12/2017 with seedling rate (120 kg ha^{-1}). The experimental unit area (1.5 m × 3 m). The experiment was layout according to completely randomized block design (RCBD) with four replicates, the experiment included nine treatments. DAB fertilizer (18: 46: 0) was added at rate of 200 kg h^{-1} during soil preparing for cultivation. Nitrogen fertilizer was added

Table 1: Soil and Water Analysis (Central Laboratory of the Directorate of Agriculture of Babel / Al-muradiya).

0.M %	NH_4 (ppm)	No_3 (ppm)	P (ppm)	K (ppm)	pH	EC	Sample type	NO
1.54	9	18	7.7	274	8.1	7.2	Soil	1
					7.1	2.3	Water	2

in the form of urea (46% N) at rate of 200 kg h^{-1} with three applications (quarter of quantity of the fertilizer was added at the tiller and half quantity at the elongation and the remaining at the booting). Nutrients were sprayed during foliar fertilizer were (urea sprayed at a concentration 6.75 $g.L^{-1}$, potassium nitrate sprayed at a concentration of 6.75 $g.L^{-1}$, potassium chloride sprayed at a concentration of 6.75 $g.L^{-1}$, potassium sulfate sprayed at a concentration of 6.75 $g.L^{-1}$, zinc nitrate sprayed at a concentration of 100 $mg.L^{-1}$, zinc chloride sprayed at a concentration of 100 $mg.L^{-1}$, humic acid sprayed at a concentration of 22.5 $mg.L^{-1}$, a mixture trace elements sprayed at a concentration of 90 $mg.L^{-1}$ and the treatment of spraying only water that treated as treatment of control). Spray concentrations were made by dissolve recommended quantity in two litter of water. Fertilizer was sprayed in the early morning until full wetness of plants taking into account the separation of experimental units. The first spray was performed at the boot stage (GSZ45) and anthesis stage (GSZ65) which were determined according to the Zadoks scale shown in attached 2 (Zadoks *et al*., 1974).

Studied properties of seeds

- **First: laboratory characteristics of seeds:**

1. Tetrazoleum (%): This test was conducted according to the methods recommended by the International Seed Testing Association (ISTA, 1985; AOSA, 2000).

2. Standard laboratory germination (%): One hundred seeds were randomly germinated and healthy seedling number was calculated after four days (the initial count) and eight days (final count) from date of planting and transformed to percentages according to the following formula (ISTA, 2010):

$$\text{Healthy Seedling Rate \%} = \frac{\text{Number of Seedlings}}{\text{Total Number of Seeds}} \times 100$$

3. Germination under aging or acceleration of aging (%) : One hundred seeds were taken randomly and placed under 65°C for 72 hours in an electric oven, then placed under 5°C for another 72 hours in the fridge. Healthy seedling number was counted four days post-germination (initial count) and eight days (final count) and transformed to percentages according to the following equation (Karrfalt, 2002):

$$\text{Healthy Seedling Rate \%} = \frac{\text{Number of Seedlings}}{\text{Total Number of Seeds}} \times 100$$

4. Cold germination (%): One hundred seeds were grown randomly, placed under 10°C, seven days later, number of healthy seedlings was calculated and transformed to a percentage according to the following equation (Copeland and McDonald, 2001):

$$\text{Healthy Seedling Rate \%} = \frac{\text{Number of Seedlings}}{\text{Total Number of Seeds}} \times 100$$

5. Length of the seedling, coleoptile and the radical (cm): were measured separately after Separated them from their point contact with the seed (ISTA, 2005).

6. Dry weight of the seedling: Ten healthy laboratory seedlings were taken and dried in an electric oven at 60°C for 72 hours then weighed to extract the medium (ISTA, 2005).

7. Germination vigor indicator and Seedling vigor indicator : were calculated using the following equations (Murti *et al*., 2004):

$$\text{Germination vigor indicator} = \frac{\text{Length of coleoptile + Length of radicle}}{\text{Germination ratio \%}} \times 100$$

$$\text{Seedling vigor indicator} = \frac{\text{Length of coleoptile + Length of radicle}}{\text{Germination ratio \%}} \times 100$$

- **Second: field experiment.**

1. Ratio and speed of field emergence (%): Emerged seedlings of seeds of previous season treatments were calculated on the initial emergence (speed of field emergence) and 21 days after the cultivation (percentage of field emergence) using the following equation (ISTA, 2005) :

$$\text{Percentage of field emerging \%} = \frac{\text{Number of stable emerged seedlings}}{\text{Total Number of Seeds}} \times 100$$

2. Field establishment (%): stabilized filed seedlings were counted at tiller stage (GSZ25) to calculate the percentage of field establishment using the following equation (ISTA, 2005):

$$\text{Field establishment ratio \%} = \frac{\text{Number of stable emerged seedlings}}{\text{Total Number of Seeds}} \times 100$$

3. The leaves and tillers of ten field-grown seedlings were calculated to extract their medium (ISTA, 2005).

4. Dry weight of field-founded seedling: Ten healthy seedlings were taken and dried in an electric oven at 60°C for 72 hours and then weighed to extract the medium (ISTA, 2005).

Statistical analysis

Statistical data were statistically analyzed using the statistical method (GenStat). Statistical differences were examined between the mediums using the Duncan test and the probability level of 0.05 for comparison between mediums (Duncan, 1970).

Results and Discussion

Laboratory tests

Results of the statistical analysis indicated that there were a significant differences between the foliar

Table 2: The Effect of Spraying of foliar nutrients on laboratory tests of Seeds (Tertrazolium, the ratio of standard laboratory germination in the initial count and final count, rate of germination of aging acceleration in the initial count and final count and percentage of cold germination).

Treatment of foliar fertilizer		Ratio of cold germination (%)	Germination under aging, intial count (%)	Germination under aging, final count (%)	Ratio germination, intial count (%)	Ratio germination, final count (%)	Tertrazolium (%)
T1	NH_2CO	88.50ab	94.50a	94.50a	92.50a	95.50a	91.0a
T2	KNO_3	83.50c	83.00c	83.00b	81.50c	88.50b	83.0b
T3	KCl	87.75ab	90.75abc	92.00a	90.25ab	94.00ab	84.5a
T4	K_2SO_4	88.50ab	86.25bc	90.25a	84.75bc	91.25ab	85.5ab
T5	$ZN(NO_3)2$	85.25bc	87.50abc	89.25a	88.25ab	93.00ab	82.5b
T6	$ZNCl_2$	89.00ab	89.50abc	91.00a	84.25bc	90.00ab	82.5b
T7	H.A	88.75ab	86.00bc	91.75a	87.50abc	92.25ab	87.5ab
T8	T.E	91.00a	88.75abc	91.00a	87.25abc	91.50ab	88.5ab
T9	Control	86.25bc	92.25ab	95.00a	89.75ab	96.25a	91.0a
Average		87.61	88.72	90.81	87.39	92.47	86.22
Coefficient of variation		2.8	5.5	4.1	5.0	4.0	2.9
Significant 5 (%)		S	S	S	S	S	S

DMRT 2 values

Cold germination	Under aging initial count	Under aging final count	Standard germination, initial count	Standard germination, final count	Tertrazolium
T8 91.0 a	T1 94.5 a	T9 95.0 a	T1 92.50 a	T9 96.25 a	T1 91.0 a
T6 89.0 ab	T9 92.2 ab	T3 92.0 a	T3 90.25 ab	T1 95.50 a	T9 91.0 a
T7 88.7 ab	T3 90.7 abc	T1 94.5 a	T9 89.75 ab	T3 94.00 ab	T8 88.5 ab
T1 88.5 ab	T6 89.5 abc	T7 91.7 a	T5 88.75 ab	T5 93.00 ab	T7 87.5 ab
T4 88.5 ab	T8 88.7 abc	T6 91.0 a	T7 87.50 abc	T7 92.25 ab	T4 85.5 ab
T3 87.7 ab	T5 87.5 abc	T8 91.0 a	T8 87.25 abc	T8 91.50 ab	T3 84.5 b
T9 86.2 bc	T4 86.2 bc	T4 90.2 a	T4 84.75 bc	T4 91.25 ab	T2 83.0 b
T5 85.2 bc	T7 86.0 bc	T5 89.2 a	T6 84.25 bc	T6 90.00 ab	T5 82.5 b
T2 83.5 c	T2 83.0 c	T2 83.0 b	T2 81.50 c	T2 88.50 b	T6 82.5 b

application that were sprayed in booting and anthesis stages in the laboratory properties of the basis seeds that obtained from wheat plants level of the nucleus is the local cultivur of Babel 113 (tertrazolium test, standard laboratory germination, germination under aging, cold germination, length of the radicle, length of the coleoptile, seed length, dry weight, germination vigor and seedling vigor.

The results of table 2 showed that the spraying of some nutrients (zinc chloride, zinc nitrate, potassium nitrate and potassium chloride) reduced the vitality of the seeds tested in the tertrazolium test compared to control with compared to other treatment. Foliar application with potassium nitrate caused a reduction in germination rate during initial counting tests and final count of laboratory standard germination and the initial counting of the aging acceleration test and final counting of the aging acceleration test (81.5%, 88.5% 83%, 83%) respectively, compared with spraying of water only (96.25%, 92.25%, 95%) respectively, while the other spraying treatments did not affect significantly. Foliar application of micronutrients (91.00%) gave the highest rate of seed germination compared to control treatment (spraying with water only) which gave (86.25%). The difference was not significantly different from spraying with zinc chloride, humic acid, urea, potassium sulphate and potassium chloride.

Result of table 3, showed that the highest medium length of the radicle was obtained with potassium sulphate (11.53 cm) compared to spraying with water only (10.00 cm). Potassium sulfate was not significantly differentiated from potassium chloride, micro-elements and potassium nitrate. The highest medium of coleoptiles length was obtained from potassium nitrate (6.75 cm) compared control (5.75 cm). Potassium nitrate was not significantly differentiated from the spraying with potassium sulfate, zinc chloride and potassium chloride. The spraying with urea, zinc nitrate, micro-nutrients and humic acid were not significantly different from the comparison treatment. The highest mean of seed length obtained from potassium sulphate was (18.23 cm) compared with the water spray

Table 3: Effect of spraying with foliar nutrients on laboratory tests of Seeds (length of the radicle, length of coleoptile, length of the seedling, dry weight and vigor of germination and seedling).

Treatment of foliar fertilizer		Radicle length (cm)	Coleoptile length (cm)	Seedling length (cm)	Dry weight of seedling (mg)	Germination vigor	Seedling vigor
T1	NH_2CO	10.30cd	6.12bcd	16.43bc	32ab	17.23cd	15.55abc
T2	KNO_3	10.75abcd	6.75a	17.50ab	33ab	19.80ab	15.50abc
T3	KCl	11.22ab	6.40abc	17.62ab	32ab	18.78abc	16.55ab
T4	K_2SO_4	11.53a	6.70ab	18.23a	32ab	19.98a	16.62a
T5	$ZN(NO_3)2$	10.55bcd	6.07cd	16.62bc	35a	17.93bcd	15.45abc
T6	$ZNCl_2$	10.50bcd	6.60abc	17.10ab	35a	19.03abc	15.35abc
T7	H.A	9.97d	5.80d	15.78c	33ab	17.15cd	14.57c
T8	T.E	11.02abc	6.02cd	17.05ab	32ab	18.75abc	15.60abc
T9	Control	10.00d	5.75d	15.75c	30b	16.40d	15.17bc
Average		10.65	6.247	16.90	32.67	18.34	15.60
Coefficient of variation		5.0	5.9	4.5	5.9	6.6	5.4
Significant 5 (%)		S	S	S	S	S	S

DMRT 3 values

Radicle length	Coleoptile length	Seedling length	Dry weight	Germination vigor	Seedling length
T4 11.53 a	T2 6.75 a	T4 18.23 a	T5 35 a	T9 16.40 a	T4 16.62 a
T3 11.22 ab	T4 6.70 ab	T3 17.62 ab	T6 35 a	T7 17.15 ab	T3 16.55 ab
T8 11.03 abc	T6 6.60 abc	T2 17.50 ab	T2 33 ab	T1 17.23 ab	T8 15.60 abc
T2 10.75 abcd	T3 6.40 abc	T6 17.10 ab	T7 33 ab	T5 17.93 abc	T1 15.55 abc
T5 10.55 bcd	T1 6.12 bcd	T8 17.05 ab	T1 32 ab	T8 18.75 bcd	T2 15.50 abc
T6 10.50 bcd	T5 6.07 cd	T5 16.62 bc	T3 32 ab	T3 18.78 bcd	T5 15.45 abc
T1 10.30 cd	T8 6.02 cd	T1 16.43 bc	T4 32 ab	T6 19.03 bcd	T6 15.35 abc
T9 10.00 d	T7 5.80 d	T7 15.78 c	T8 32 ab	T2 19.80 cd	T9 15.17 bc
T7 9.97 d	T9 5.75 d	T9 15.75 c	T9 30 b	T4 19.98 d	T7 14.57 c

only which gave the lowest medium length of (15.75 cm), while spraying with potassium sulfate did not differ significantly from the spraying with potassium chloride, potassium nitrate, zinc chloride and trace elements. The highest medium of dry weight was obtained from zinc nitrate and zinc chloride (35 mg) compared with control which gave the lowest medium of (30 mg). Treatments of (potassium nitrate, humic acid, urea, potassium chloride, potassium sulphate and micro-elements) were not significantly different from foliar apply of zinc chloride and zinc nitrate or from control treatment. In addition, the germination vigor was not affected by spraying with humic acid or urea or zinc nitrate compared with control treatment as vigor germination mediums were (17.15, 17.23, 17.93) respectively, while the control treatment gave the highest medium of vigor germination of 16.40. Spraying of potassium sulphate, potassium nitrate, zinc chloride, potassium chloride and micro-nutrients resulted in a significant decrease in the vigor of seed germination compared to control treatment while Potassium sulphate (T4) showed the highest medium of the index of vigor of the seedling of (16.62) compared to the control treatment that gave only (15.17), followed by treatment of potassium chloride which gave (16.55), while other treatment did not differ significantly.

Field tests of vitality and vigor of seed

The results of the statistical analysis showed that there were a significant differences between foliar apply of nutrients that were sprayed in the booting and anthesis stages in the field traits of the basis seeds obtained from the nucleus wheat plants Babil local cultivar 113 (ratio of emergence, the speed of emergence, field establishment, number of leaves, number of tillers and dry weight).

The results of table 4 spraying of potassium sulphate gave the highest medium of ratio of field emergence and speed of field emergence ratio (82.25%, 54.00%, 80.8%) respectively and significantly exceeded over control treatment (66%, 44%, 62%) respectively and other treats, while treatment of urea significantly was superior to all the treatments including treatment of control in giving the highest medium number of leaves and the highest number of tillers (4.05 sheets, 2.9 tillers), while there wasn't a significant difference within all other treatment including control treatment that gave the medium of leaves (4.00 sheets, 2.3). The treatment of spraying of the micro elements gave the highest dry weight of (128.2 mg) compared with the spraying with control which gave

Table 4: The Effect of Spraying with nutrients on field tests of basis seed (Percentage and speed of field emergence, field establishment, number of leaves, number of tillers and dry weight) of field seedling of wheat plants Babil local cultivar 113.

Treatment of foliar fertilizer		Ratio of field emergence	Speed of field emergence	Field establishment	Leaves number of seedling	Branch number of seedling	Dry weight
T1	NH_2CO	63.5b	39.2b	60.5b	4.05a	2.90a	126.8a
T2	KNO_3	61.8b	43.5ab	60.0b	4.00b	2.65ab	116.2 bc
T3	KCl	61.0b	43.2ab	58.0b	4.00b	2.40ab	114.8bc
T4	K_2SO_4	82.2a	54.0a	80.8a	4.00 b	2.30ab	126.8a
T5	$ZN(NO_3)2$	68.8b	52.2ab	66.2b	4.00 b	2.50ab	113.0c
T6	$ZNCl_2$	62.5b	39.5b	60.2b	4.00 b	2.60 ab	123.2ab
T7	H.A	65.5b	45.8ab	61.0b	4.00b	2.65ab	124.2ab
T8	T.E	66.8b	51.2ab	64.5b	4.0b	2.80ab	128.2a
T9	Control	66.0b	44.0ab	62.0b	4.00b	2.30ab	111.0c
Average		66.4	45.9	63.7	4.006	2.567	120.4
Coefficient of variation		11.1	18.2	11.3	0.8	14.0	5.2
Significant 5 (%)		S	S	S	S	S	S

DMRT 4 values

Emergence ratio	Emergence speed	Field establishment	Leave number	Branch number	Dry weight
T4 82.25 a	T4 54.00 a	T4 80.75 a	T1 4.1 a	T1 2.900 a	T8 128.2 a
T5 68.75 b	T5 52.25 ab	T5 66.25 b	T2 4.0 b	T8 2.800 ab	T1 126.8 a
T8 66.75 b	T8 51.25 ab	T8 64.50 b	T3 4.0 b	T2 2.650 ab	T4 126.8 a
T9 66.00 b	T7 45.75 ab	T9 62.00 b	T4 4.0 b	T7 2. 650 ab	T7 124.0 ab
T7 65.50 b	T9 44.00 ab	T7 61.00 b	T5 4.0 b	T6 2.600 ab	T6 123.2 ab
T1 63.50 b	T2 43.50 ab	T1 60.50 b	T6 4.0 b	T5 2.500 ab	T2 116.2 bc
T6 62.50 b	T3 43.25 ab	T6 60.25 b	T7 4.0 b	T3 2.400 ab	T3 114.8 bc
T2 61.75 b	T6 39.50 b	T2 60.00 b	T8 4.0 b	T4 2.300 b	T5 113.0 c
T3 61.00 b	T1 39.25 b	T3 58.00 b	T9 4.0 b	T9 2.300 b	T9 111.0 c

the lowest dry weight of (111 mg), spraying of micro elements was not significantly different from the treatments of (urea, potassium sulphate, humic acid and chloride Zinc), while the treatments of potassium nitrate, potassium chloride and zinc nitrate were not significantly different from control treatment.

The results generally indicated that compounds that containing potassium (potassium sulphate, potassium chloride and potassium nitrate) had a clear effect in improving seedling indicators in field and laboratory tests (Tables 2, 3 and 4), which confirms importance of the addition of potassium, which is known to have a physiological role by improving the ability of the plant to withstand stress especially heat stress and drought as well as it's role in controlling translocation of dry matter within parts of the plant and osmosis processes (Pettregrew, 2008; Fusheng, 2006), especially the translocation of dry matter towards seeds which are the key to the success of germination processes and emergence field establishment until the plant relies on itself to manufacture it's food by photosynthesis (Sharma and Anderson, 2003; Farhoudi and Motamedi, 2010) and this could be confirmed in tables 3 and 4. The increase size of seeds may increase structure of leaves and roots which is reflected in giving of larger sizes of seedlings through the increase in the number of leaves and dry matter, which is confirmed in table 4.

The vigor and speed of field emergence depends on length of coleoptiles, radicle and length of seedling because length of coleoptiles is the main indicator for measuring the vigor of the seedling because they are closely related to the field emergence and the resistance to the poor field conditions surrounding the seedbed, therefore, any damage could make damage for plants whether it is biologically, physically or mechanically it will have a negative effect on field emergence. Thus, the seeds with the highest average length of the coleoptiles and radicle have the highest seed strength compared to the seeds that have a lower average (Filho, 2015). Therefore, the spraying of potassium compounds (sulphates, nitrates and chlorides) gave high mean length of the root, the coleoptile and the length of the seed (Table 3).

This study shows that zinc compounds (zinc chloride and zinc nitrate) have improved seedling characteristics. This is indicated by the laboratory tests (Table 2), which gave high indicators for germination tests. The spraying of trace elements gave high indicators in speed and ratio of seedling, field establishment, leaves number, branch number and dry weight (Table 4), while the urea spray had a clear effect on the field characteristics of the plants, number of leaves and the number of tillers (Table 4), as well as the improvement of the vitality and vigor of the seeds and high germination rates (Table 3).

Improvement of certain qualities over other when spraying one of these nutrients indicated that each nutrient affects certain properties over others, so the combination of them with the presence of potassium as well as zinc may have a greater impact. In addition, time of spraying of nutrients at some stage before booting stage (elongation, for example) may be better because it gives sufficient time for nutrient representation within the plant and increase the efficiency of the effect. Spraying may have a negative effect in the later stages of growth on seed properties as spraying could causes physical and chemical effects as result of the movement of plants and disruption of physiological activities and pollination and the growth of pollen tube and fertilization and the emergence of ovary, all these processes may be confused because random and non-directed spraying.

Conclusions

We conclude from this study that the foliar spray of nutrients in the stages of (booting and anthesis stages) contributed to improve quality, vitality and vigor of the wheat seeds of cultivar (Babel 113). Foliar spray with nutrients containing potassium compounds was the best over other nutreints. Also foliar spraying has contributed to improve seedling indicators in field and laboratory tests.

References

Amin, H.M. and A.H. Abbas (1988). Test and certification of seeds. Ministry of Higher Education and Scientific Research. Directorate of Dar Al-Kutub for Printing and Publishing. University of Al Mosul. 270.

Arif, M., M.A. Khan, H. Akbar and S. Ali (2006). Prospects of wheat as a dual purpose crop and its impact on weeds. *Pak. J. Weed Sci. Res.*, **12 (1-2):** 13-17.

Association of Official Seed Analysts (AOSA) (2000). Seed testing handbook. Contribution. 29. Handbook on seed testing. Lincoln, NE.

Al-Khafaji, K.M. (2008). Seed technology faculty of Agriculture. Baghdad University. Ministry of Higher Education and Scientific Research. 725.

Al-Maeini, A.H. and M.A. Al-ubaidi (2018). Scientific principles of agronomy management, production and improvement. Dar Al-Wareth Printing & Publishing and Translation. 1067

Al-Maeini, A.H. (2015). *Plant ecology*. Dar Al-Jamiaea for Printing, Publishing and Translation of Higher Education and Scientific Research. 712.

Bhaskran, M., A. Bharathi, K. Vanangamudi, P. Natesan, N. Natarajan, Jerlin and K. Prabakar (2005). Textbook on Principles of Seed Production and Quality Control. Kalyany Publishers. New Delhi. India. 426.

Bareke, T. (2018). Biology of seed development and germination physiology. *Adv. Plants Agric Res.*, **8(4):** 336-346.

Curley, S. (1994). Foliar Nutrition Handbook. *Midwest Laboratories*, Inc., Omaha, NE. 81.

Copeland, L.O. and M.B. McDonald (2001). Principles of seed science and technology. fourth edition. Kluwer Academic Publisher. *Boston. Dordrecht.*, London. 467.

Dhillon, S.S., J.I. Ortiz and R. Monasterio (1993). Effects of date of sowing on the yield and yield components of spring wheat and their relationship with solar radiation and temperature at Ludhiana, Punjab, India, Wheat Special Report No. 23a. Mexico, D.F.: CIMMYT.

Dhillon, S.S., J.I. Ortiz and R. Monasterio (1993). Effects of date of sowing on the yield and yield components of spring wheat and their relationship with solar radiation and temperature at Ludhiana, Punjab, India, Wheat Special Report No. 23a. Mexico, D.F.: CIMMYT.

Duncan, D.B. (1970). Multiple Range and multiple F. tests. *Biometrics.*, **11:**1-42.

Eagli, D.B. (1998). *Seed biology and the yield of grain crops*. Wallingford, UK: C.A.B. International. 178.

Fan, X.L., D. Jiang, T. Dai, Q. Jing and W. Cao (2005). Effects of nitrogen supply on flag leaf photosynthesis and grain starch accumulation of wheat from its anthesis to maturity under drought or water logging. *Journal of Applied Ecology.*, **16:** 1883-1888.

Farhoudi, R. and M. Motamedi (2010). Effect of salt stress and seed size on germination and early seedling growth of safflower (*Carthamus tinctorius* L.). *Seed Sci. Technol.*, **38:** 73-78.

Filho, J.M. (2015). Seed vigor tasting :an overview of the past, present and future perspective. *Scientia Agricola*., **72(4):** 1-17.

Fusheng, L. (2006). Potassium and water interaction. International Workshop on Soil Potassium and K Fertilizer Management, *Agric. Col.*, Guangxi Univ., 14 Nov.

Gastel, A.G., M.A. Pagnotta and E. Poreceddu (1996). Seed Science and Technology. ICARDA. Syria. 311.

International Seed Testing Association (ISTA) (2010). International rules for Seed Testing. Edition 2010. 504.

International Seed Testing Association (ISTA) (2005). International rules for seed testing. Adopted at the Ordinary Meeting. 2004, Budapest, Hungary to become effective on 1st January, 2005.

International Seed Testing Association (ISTA) (1985). International rules for Seed Testing. *Seed Technol.*, **13:** 356-513.

Karrfalt, R.P. (2002). Woody Plant Seed Manual. *Seed Testing*. Chapter **5:** 97-116.

Madani, A., A.H. Shirani Rad, A. Pazoki, G.H. Nour mohammadi and R. Zarghami (2010). Grain filling and dry matter partitioning responses to source: sink modifications under post-anthesis water and nitrogen deficiencies in winter wheat (*Triticum aestivum* L.). *Acta Scientiarum Agronomy.*, **32:** 145-151.

Milosevic, M. and M. Malisevec (2004). Seed science institute of field and vegetable crops and national laboratory for seed tasting, *Novi sad*.

Milosevic, M., M. Vujakovic and D. Karagic (2010). Vigour tests as indicators of seed viability. *GENETIKA*., **42(1):** 103-118.

Murti, G.S., R. Sirohi and K.K. Uoreta (2004). *Glossary of plant Physiology*. Daya Publishing house. Delhi. 207.

Oosterhuis, D., K. Hake and C. Burmester (1998). Foliar feeding cotton. *Cotton Physical*., *Today* **2:** 1-7.

Pettigrew, W.T. (2008). Potassium influences on yield and quality production for maize, wheat, soybean and cotton. *Physiologia Plantarum*., **133:** 670-681.

Saint, P.C., C.J. Peterson, A.S. Ross, J.B. Ohm, M.C. Verhoeven, M. Larson and B. Hoofer (2008). Winter wheat genotypes under different levels of nitrogen and water stress: changes in grain protein composition. *J. of Cer. Sci*., **47:** 407-416.

Sharma, D.L. and W.K. Anderson (2003). The influence of climatic factors and crop nutrition on seed vigor of wheat. Solution for a better environment. Proc. of the 11th Australian Agron. Conf., Geelong, Victoria, *Australia Soc. of Agron*., 2-6 Feb., 2003. Al-moradyah

Singh, S.K. and K. Kailasanathan (1976). A note of the effect of seed size on yield of wheat cultivar Kalayan Sona under late sown conditions. *Seed Res*., **4:** 130-131.

Sultana, N., T. Ikeda and M.A. Kashem (2001). Effect of foliar spray of nutrient solutions on photosynthesis dry matter accumulations and yield in sea water stressed rice. *Environ. Exp. Bot*., **46:** 129-140.

Wissuma, M., A.M. Ismail and R.D. Graham (2008). Rice grain zinc concentrations as affected by genotype native soil – zinc availability and zinc fertilization. *Plant Soil.,* **306:** 37-48.

Zadoks, J.C., T.T. Chang and C.F. Konzak (1974). A decimal code for the growth stages of cereals. *Weed Res*., **14:** 415.