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Effect of gibberellic acid on breaking post harvest dormancy in seeds of *Zea mays* L.

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ABSTRACT

The experiment was conducted during Summer 2012 in (Lab. Experiment: In laboratory seed technology – Field Crops Department / Collage of Agriculture – Green Qassim University) and (Field experiment: in one field of Abo-Gharaq / Babyonl), to investigate the response of synthetic Maize variety(Buhooth 106) to different planting Date and different levels Gibberellins(GA_3) , A split plot arrangement in randomized complete block design , with three replication was used . The treatments Were three planting Dates (D_1 , D_2 and D3) with five levels of Gibberellins GA_3 (0 , 25, 50 , 75, 100 and 200)ppm . significant differences were found among planting Dates and Gibberellins levels with Their interactions for same the studied traits. The Lab Experiment in treatment third date (D_3) was superior in germination percentage (64%) , germination period (3.491 day/seed) and germination action (36.97%) ; So Gibberellins level (100ppm) was superior in germination percentage (89.33%) , germination period (3.328 day/seed) , coefficient speed germination (29.93) and germination action (35.27%) ; Overlap among the traits found(D_3 * 100ppm Gibberellins) in germination percentage (94.33%) , germination period (3.063 day/seed) , coefficient speed germination (32.80) and germination action (40.13%). The field experiment in treatment third date (D_3) was superior in leaf area (530.13 cm^2), grain weight (188.47 mg) , plant biological yield (277.17 g) and plant grains yield (99.40 g) and harvest index(35.82%) , So Gibberellins level (100ppm) was superior in leaf area (577.78 cm^2) , No. of grains/ kernel (565.78) , grain weight (195.22 mg) ,plant biological yield (267.66 g) , plant grains yield (101.56 g) and harvest index (37.91%). A linear relationship was found between studied traits and both planting Date and Gibberellins levels (D_3 * 100ppm Gibberellins) in leaf area (608 cm^2) , No. of grains/ kernel (589) , grain weight (204 mg) ,plant biological yield (288.90 g) , plant grains yield (112.69 g) and harvest index (39%) .

Keywords: Germination, dormancy, maize, gibberellic acid, planting date

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INTRODUCTION

MAIZE (Zea mays L.) one of important Grain crops strategic in Iraq, as used grain as food for humans , manufacture of beverages, Forage animals and several industrial fields like starch , glues , oil industry and in addition to its use as a food it is used for pigment varnishes and rubber industry [1].

Production seeds which have high production of maize needs great efforts for adoption on several factors, optimal planting dates for modern private seed harvest and the readiness of these grains for planting.

Grain maize have suffered lower qualities germination for Seed that modern harvest and the amount of readiness for planting because of the slow maturation of after harvesting [2], Time between harvest (for planting spring) and seedling (for planting autumn) will limit readiness of the complete grain, so that seedling date is very important for planting autumn especially modern grain harvest [3].

Planting Date is important factors affecting the vegetative traits, Seed of crops especially maize need to be a period of maturity after harvesting to complete their growth and arrived to full maturity , this needs to be storage a period under favorable conditions [4], Grains maize have dormancy after harvesting and different according to Storage conditions [5] , the period between harvest and planting (for planting autumn) be specific to the completion of the maturity of grain as the determining harvest time with the date of planting is an important factor [6] So as to ensure access to grains with high qualities germination under this conditions (stored period after the harvest) [7].

The researchers used many methods to break seed dormancy which is from non complete growth seed after harvest , These methods was like stiffening conditions , chemical treatments and stored seed to special conditions make less mature after harvest [8].

Gibberellin is one of plant growth regulators which is pricking for breaking dormancy and increase their activates , So seed will germinate [9] ; In another studies , Gibberellin work on accrual and increase of food nutrients in seed , So embryo will be pricking and germination seed [10] , [11]; Gibberellin have important act in biotic seed after harvest and in stored [12], So Gibberellin work on break dormancy , germination of seed and positive effect on yield and his components [13].

So this experiment was carried out to know ability for planting grains Maize which is modern harvesting in (autumn planting) with Gibberellin to break dormancy.

METHODS AND MATERIALS

The experiment was carried out in (Lab. Experiment: In laboratory seed technology – Field Crops Department – Collage of Agriculture Al–Qasim Green University) and (Field experiment: in one field of Abo-Gharaq (about 10 km western north center of Babylon city).

The experiment was carried out as a split-plot design based on Randomized Complete Block Design with three replications , in which planting dates made main-plots with three levels and gibberellic acid made the sub-plots with five levels.

Planting dates included (D_1 : planting after three days from harvest) , (D_2 : planting after four days from harvest) and (D_3 : planting after five days from harvest) ; To determine the effect of Gibberellin, it was applied in five concentrations including 0, 25, 50,100, and 200 ppm ; Seed was saturated in Gibberellin for 12 hours under non light conditions at amount 250gm seed / 500 ml solution [14] .

Analysis of variance (ANOVA) and means comparison was carried out by L.S.D. test under incorporeity level 5% [15]with S.A.S. program [16] .

Lab. Experiment used for Petri dish for germination in seed birth under temperature 25 $^{\circ}$C ±2 [17] ; Studies traits was : germination percentage (%) – germination period (day/seed) - coefficient speed germination – germination action (%) .

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In Field experiment , Treatments was randomized distributed in (4×3)m^2 plot , f planting date (for planting spring) was in 20/march [18] and (for planting autumn) in treatment ; the cultivar (Bohoth 106) which used for in study .

N fertilizer added as Urea (46%) in rate 400 kg N / ha on two defrayments : first at 6 leaves stage , second after 30 days from first [19]; P fertilizer added at planting in rate 200 kg P_2O_5 /h [20] ; Studies traits was : rate leaf area (cm^2) – plant biological yield (g) – No. grains/kernel – Grain weight (mg) – plant grains yield (g) – harvest index (%) .

Soil of the field was checking to know (physical and chemical traits) in Soil department laboratories /collage of agriculture , The result was in table (1) :

Table 1: Physical and chemical analysis for soil before planting :

Studies traits	Rate
(PH)	7.8
(Ec)	3.1
Sand(%)	30.5
Clay(%)	38.4
Silt(%)	29.8
Contexture	Admixture Clay

RESULTS AND DISCUSSION

Treatment	Germination percentage (%)	Germination Period (day/grain)	coefficient speed germination	Germination action
Planting Date				
D_1	56.93	3.618	27.77	34.08
D_2	61.07	3.599	28.84	34.06
D_3	64.0	3.491	28.04	36.97
L.S.D	2.909	0.0330	N.S	0.302
Gibberellins				
0	36.78	3.962	25.20	31.38
25	47.11	3.809	26.34	33.90
50	66.33	3.528	28.43	36.20
100	89.33	3.221	31.17	38.44
200	63.78	3.328	29.93	35.27
L.S.D	4.165	0.0991	2.019	0.899
Interaction				
D_1 G_1	35.33	3.907	25.60	30.60
G_2	42.67	3.900	25.43	32.80
G_3	69.00	3.540	28.00	35.00
G_4	90.33	3.283	30.40	37.40
G_5	68.00	3.367	29.40	34.60
D_2 G_1	36.00	3.993	25.00	29.90
G_2	51.33	3.577	28.00	33.10
G_3	58.33	3.220	31.00	35.50
G_4	83.33	3.317	30.30	37.80
G_5	55.67	3.350	29.90	34.00
D_3 G_1	39.00	3.987	25.00	33.63
G_2	47.33	3.950	25.60	35.80
G_3	71.67	3.823	26.30	38.10
G_4	94.33	3.063	32.80	40.13
G_5	67.67	3.267	30.50	37.20
L.S.D	6.759	0.1551	4.580	1.407

Table 2: Effect planting date and Gibberellins on germination traits

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Planting Date was given differences incorporeity in germination traits (Table 2) , Treatment third date (D_3) was superior in germination percentage (64%) , germination period (3.491 day/seed) and germination action (36.97%) , So the planting date and harvesting is very important to give strong growth after germination [6] ,the period of between harvest and germination is very important to complete maturity in long time after harvesting with good storage [4].

Levels Gibberellin given differences incorporeity in germination traits (Table 2) , Treatment GA(100 ppm) was superior in germination percentage (89.33%) , germination period (3.221day/seed) , coefficient speed germination (31.17) and germination action (38.44%) , this result agree [11] , [9].

The interaction (Table 2) between planting dates with levels Gibberellin in germination traits was found in treatment ($D_3 \times$ GA 100) , So this treatment was superior in germination percentage (94.33%) , germination period (3.063 day/seed) , coefficient speed germination (32.80) and germination action (40.13%) .

Table 3: Effect planting date and Gibberellins on yield traits

Treatment	leaf area (cm^2)	No. of grains / kernel	Weight grain (mg)	Plant biological yield (g)	Plant grains yield (g)	Harvest index (%)
Planting Date						
D_1	501.40	510.73	171.80	234.80	83.34	35.47
D_2	517.9	523.47	182.87	265.06	91.93	34.65
D_3	530.13	529.53	188.47	277.17	99.40	35.82
L.S.D	11.074	N.S	8.396	13.990	5.693	N.S
Gibberellins						
0	427.11	473.00	169.34	250.08	83.00	33.19
25	476.11	498.44	178.56	257.78	89.89	34.90
50	555.11	546.89	186.89	261.27	95.00	36.34
100	577.78	565.78	195.22	267.66	101.56	37.91
200	546.22	522.11	175.22	258.26	88.34	34.23
L.S.D	26.403	56.092	12.589	5.904	9.111	2.289
Interaction						
D_1 G_1	424.67	466.67	157.34	231.20	77.00	33.30
G_2	463.67	491.32	166.68	232.90	83.00	35.63
G_3	565.00	532.31	176.33	236.90	86.00	36.30
G_4	538.67	543.69	188.66	238.25	89.62	37.63
G_5	515.00	519.65	170.00	234.77	81.00	34.50
D_2 G_1	434.00	471.00	171.33	258.24	83.68	32.40
G_2	475.67	498.67	181.00	269.80	90.66	33.60
G_3	527.33	538.67	186.66	266.83	95.00	35.60
G_4	586.67	564.67	193.00	275.83	102.34	37.10
G_5	565.67	544.33	182.34	254.57	88.00	34.56
D_3 G_1	422.67	481.33	179.35	260.80	88.34	33.87
G_2	489.00	505.34	188.00	270.63	96.00	35.47
G_3	573.00	569.68	197.69	280.07	104.00	37.13
G_4	608.00	589.00	204.00	288.90	112.69	39.00
G_5	558.00	502.34	173.35	285.43	96.00	33.63
L.S.D	33.133	70.587	14.739	19.551	16.477	3.483

Planting Date was given differences incorporeity in yield traits (Table 3) , Treatment third date (D_3) was superior in leaf area (530.13 cm^2), grain weight (188.47 mg) ,plant biological yield (277.17 g) and plant grains yield (99.40 g) , So [3] found that date of planting is very important in limitation yield traits and composites .

Levels Gibberellin given differences incorporeity in yield traits (Table 3) , Treatment GA(100 ppm) was superior in leaf area (577.78 cm^2) , No. of grains/ kernel (565.78) , grain weight (195.22 mg) ,plant biological yield (267.66 g) , plant grains yield (101.56 g) and harvest index (37.91%) , this agree with[13], [21].

The interaction (table 3) between planting dates with levels Gibberellin in yield traits was found in treatment (D_3 × GA 100) , So this treatment was superior in leaf area (608 cm^2) , No. of grains/ kernel (589) , grain weight (204 mg) ,plant biological yield (288.90 g) , plant grains yield (112.69 g) and harvest index (39%) .

REFERENCES

[1] Martin , J. H. ; W. H. L. Deceased ; D. L. Stamp and R. P. Waldren (2005). Principles of Field Crop Production , 4th edition , College of Agri. – Uni. Of Texas .

[2] Reed, C. , F. H. Arthur and D.Trigo-Stockli (1998) . Conditioning practices and their effects on infestation and quality of corn stored on Kansas Farms . American Society of Agricultural Engineers J. , VOL. 14(6): 623-630 .

[3] Kamara, A. , F.Ekeleme , D. Chikoye and L. O. Omoigui (2009). Planting Date and Cultivar Effects on Grain Yield in Dryland Corn Production. Agronomy J. Vol 101(1): 91-98.

[4] Nowak, J. , K. Szambelan , H. Miettinen , W. Noeak and Z. Czarnecki (2008). Effect of the Corn grain storage method on Saccharification and ethanol fermentation yield. Acta Sci. Pol. , Technol. Aliment. , Vol. 7(1) :19-27.

[5] Willcutt, H. (2000).Harvesting, Drying and Storage Corn .Agri. and Bio. Eng. (662): 325-7345.

[6] Weston, P. A. (1994). Influence of planting date, harvest date, and maize (corn) hybrid on preharvest infestation of maize by *Sitotroga cerealla* . 6th International working conf. on stored-product Protection,Vol (1):605-607.

[7] Simic, B. , A. Sudaric , I. Liovic , I. Kalinovic , V. Rozman and J. Cosic (2008). Influence of storage condition on seed quality of maize, soybean and sunflower . 9th International Working Conf. on Stored Product Protection, 59-63.

[8] Jones, D. (1986). A chemical treatment for maize seed to control the germination of teliospores of Ustilago maydis. Aust. J. Exp. Agr. Vol. 26(2) : 187-191.

[9] Ghodrate, V. , M. J. Rousta (2012). Effect of Priming with Gibberellic Acid (GA3) on Germination and Growth of Corn (Zea mays L.) under Saline Conditions. Int. J. Agri. Crop Sci. Vol. 4 (13): 882-885.

[10] Ingle, J. and R. H. Hageman(1965). Metabolic Changes Associated with the Germination of Corn III. Effects of Gibberellic Acid on Endosperm Metabolism. Dep. Of Botany J. Ind. Vol. 11 : 672-675.

[11] Chandra, K. S. and T. Bhattarai (2003). Effect of gibberellic acid on reserve food mobilization of maize (*Zea mays* L. var Arun-2) endosperm during germination. Him J. Sci. Vol. 1(2): 99-102 .

[12] White, C. N. , W. M. Proebsting , P. Hedden and C. J. Rivin (2000). Gibberellins and Seed Development in Maize. I. Evidence That Gibberellin/Abscisic Acid Balance Governs Germination versus Maturation Pathways. American Soci. of Plant Physiologists J., Vol. (122) :1081-1088.

[13] Chowdhury, M. A. , A. K. Sarwar (2000). Effect of gibberellic acid and soil salinity on germination, yield and yield components of maize (*Zea mays* L.). Thai Journal of Agri. Sci. , Vol 33(3) : 115-122.

[14] Afzal I, Shahzad MA, Basra N, Ahmad MA, Cheema EA, Warraich AAl, Khaliq. 2002. Effect of priming and growth regulator treatment on emergence and seedling growth of hybrid maize. Inter J Agri & Bilo. 1560–8530:303–306.

[15] Dawood , Kh. M. and Z. Abdelias (1990). Methods statistic for agricultural researches , , Ministry of higher education and scientific research , University of Mosel ,Iraq .

[16] SAS(1992).SAS STAT Users Guide for Personal computer .release.6.08. SAS Institute Inc. cary.Ne. USA.

[17] ISTA (1996).Rules for seed Testing.International Seed Testing Association.Seed sci.Technol.24 suppl. Zurich, Switzerland.

[18] Darby H. M. and J. G. Lauer (2002). Planting Date and Hybrid Influence on Corn Forage Yield and Quality. Agron. J. Vol. (94): 281–289.

[19] Moraditochaee, M. , M. K. Motamed , E. Azaropour , R. Kh. Danesh and H. R. Bozorgi (2012). Effect nitrogen Fertilizer and plant density management in corn farming. ARPN J. of Agri. and Bio. Sci. Vol. 7(2) :133-137.

[20] Kawkye, P. K. and A. L. Nyamekye (1990). Direct and residual effects of phosphate fertilizer on maize *(Zea mays* L.) grown on an Ultisol in Kumasi , J. agric. Sci. Vol. (20) :93-100.

[21] Naghashzadeh , M. , M. Rafiee and A. Khorgamy (2009). Evaluation of effects of gibberellic acid on maize (*Zea mays* L.) in different planting dates. Iran , Plant Ecophysiology, Vol.(3): 159-162.