EFFECT OF GRAIN MOISTURE OF CORN AT HARVESTING ON SOME AGRONOMIC TRAITS

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ABSTRACT

This research was conducted during spring and fall seasons, 2015 , at the fields of Field Crop Department – College of Agriculture –University of Baghdad . The objective was to study the effect of grain moisture at harvesting on some agronomic traits of the corn next generation , by using synthetic variety 5018 . In spring season 2015 , seeds of this variety was planted ,when moisture of the ear grains was (37-42%) , ten ears were harvested. Ear harvesting dates were performed manually when the grains had 37-42% , 34-36% , 30-33% , 25- 28% and 19-22% moisture content. In fall season 2015 , varietal trail was carried out to the five treatment materials , using Randomized Complete Bock Design , with four replicates. The results revealed , that non significant differences between treatments (19-22)% and (25-28)% , in all the studied traits . The plants grown from the seeds of (25-28)%, were produced highest vegetative mass (116.30 g.plant^{-1}) , total dray matter (269 g. plant^{-1}) and total dray matter (1.80 kg.m^{-2}) . Highest grain yield (1.07 kg.m^{-2}) and harvesting index (0.63) were produced from plants grown from seeds harvested with (19-22)% moisture content . It can be concluded that the best moisture contents of the grains for seed production was (19-28)%.

Keywords: vegetative mass, dray matter, grain yield , harvest index .

مجلة العلوم الزراعية العراقية – 47(5): 1334- 1339 /2016 **بكتاش والخزعلي**

تأثير رطوبة حبوب الذرة الصفراء عند الحصاد في بعض الصفات الحقلية

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المستخلص

نفذ البحث خلال الموسمين الربيعي والخريفي لعام 2015 في حقول قسم المحاصيل الحقلية – كلية الزراعة – جامعة بغداد، بهدف دراسة تأثير رطوبة حبوب الذرة الصفراء أثناء الحصاد في بعض الصفات الحقلية في الموسم اللاحق. تمت في الموسم الربيعي 2015 زراعة بذور الصنف التركيبي 5018. عندما وصلت نسبة الرطوبة في حبوب العرانيص (37–40)%، حصدت منها عشرة عرانيص و اعتبرت المعاملة الاولى، حيث نفذت خمسة معاملات لخمسة مستويات لرطوبة الحبوب عند الحصاد و هي (37–42)% و (34–36)% و (30–33)% و (25–28)% و (19–22)% . في الموسم الخريفي 2015 نفذت تجربة مقارنة للمعاملات الخمسة باستعمال تصميم القطاعات الكاملة المعشاة و بأربعة مكررات وأشارت النتائج الى عدم وجود فروق معنوية بين النباتات المزروعة من حصاد حبوب بمستويين من الرطوبة (19–22)% و (25–28)% في جميع الصفات المدروسة. تفوقت النباتات التي نتجت من بذور تمت حصادها برطوبة (25–28)% في صفات الكتلة الخضراء (116.30 غم. نبات$^{-1}$) والمادة الجافة الكلية للنبات (269 غم . نبات$^{-1}$) و كذلك المادة الجافة الكلية بوحدة المساحة (1.8 كغم . م$^{-2}$) أعلى حاصل حبوب (1.07 كغم . م$^{-2}$) و اعلى دليل الحصاد (0.63) نتجت من المعاملة التي كانت رطوبتها (19– 22) % . يمكن التوصية بحصاد حبوب الذرة الصفراء برطوبة (19–22)% عند استعمالها للزراعة.

كلمات مفتاحية: الكتلة الخضرية، المادة الجافة، حاصل الحبوب، دليل الحصاد.

INTRODUCTION

The corn (*Zea mays* L.) grains moisture content at harvesting has great impact on seeds for second generation uses (1 , 19). To achieve larger productions, it is extremely important to use good quality seed, and to do so, the monitoring of seed moisture content, maximum dry matter accumulation, and appearance of black layer are important aspects (2 , 10 , 15) . The corn grain yield and it's quality in fall season production in Iraq , can be guaranteed by early harvest, due to its less exposure to adverse environmental conditions, insect attack, fungus and exposure to un appropriate of climatic factors, such as early rainfall , highest humidity and lowest temperature, in addition, it provides better utilization of the production and processing infrastructure, even if the harvesting of immature seeds occur (3 , 6 , 11) However, corn grains harvested with high moisture content are more susceptible to mechanical damage caused mainly by machinery during harvest and husking (16 , 20) . Several researchers (8 , 9 , 13 , 14) stated that the mechanical damage caused by the rotation of threshing cylinder and moisture content of corn grains at harvest may affect the germination and vigor . The progressive increase of the mechanical damage of grains contributes to the decrease of their physiological potential and for the increased occurrence of fungi on them. Each mechanical damage affecting the grains, however small, is cumulative and an integral part of the grains damage and may reduce grain quality (4 , 5) . Among the factors that contribute to obtain high physiological quality of grains produced is the harvest in the proper time . During grains maturation process , the occurrence of adverse environmental condi - tions, insect and microorganisms attacks contributes to the accelerating of seeds deteri -oration process and considering this fact , grains harvest delay negatively effects on physiological and sanitary quality of grains (13 , 14 ,) . The proper time to grains harvest is as close as possible to the physiological maturity point, where quality -ative and quantitative grain losses are at the minimum and the highest grain quality is obtained. However, in the physiological maturity point grains have high moisture content ,which makes the mechanical harvest impossible (7 , 8 ,12) . The objective of this research was to study the effect of grains harvesting moisture on some agronomic traits of corn synthetic variety 5018 in the next generation .

MATERIALS AND METHODS

This research was conducted during spring and fall seasons, 2015 , at the fields of Field Crop Department – College of Agriculture – University of Baghdad . Corn synthetic variety 5018 was used , classified as dented, produced by Agricultural Researches Direc - torate Ministry of Agriculture . In spring season 2015 , seeds of this variety were planted using 75 cm between rows and 25 cm within the rows . The field was fertilized using 320 kg.ha^{-1} Dap , which added at seed bed preparation . Urea (46% N) , with 100kg. ha^{-1} , was added two times , first part when the plants arrived 25 cm height and the other part at the beginning of flowering . All the agricultural management were performed , as recommended. When the moisture of the ear grains reach the first treatment (37-42%) , ten ears were harvested. Ear harvesting dates were performed manually when the grains had 37-42% , 34-36% , 30-33% , 25- 28% and 19-22% moisture content. Then, the grains were naturally dried to 15.5 % . In fall season 2015 , varietal trail was carried out to the five treatment materials, using Randomized Complete Bock Design , with four replicates . The same seed-bed, field and crop manag - ement were conducted . The observations were performed on five random plants . Data were subjected to the analysis of variance by F test. The means were compared using the least significant difference at 5% level , (21) .

RESULTS AND DISCUSSION

The physiological and morphological chan - ges that occur during maturation process are used as parameters to identify ideal corn grains harvest , therefore studies are necessary to determine the influence of vegetative mass , which correlate with the dray matter accumulation , total mass production , grain yield and harvest index (1 , 2) .

Vegetative mass. g. plant $^{-1}$:

Vegetative mass trait more important than dray matter , because at is this stage , the physiological activity was highest and the

transformation of accumulated matters from source to sink is higher than other late stages (15,19) . Table 1 shows significant difference among harvesting grain moisture in the first generation. The highest vegetative mass (118.52 g . plant $^{-1}$) produced from the plants their seeds harvested with 30-33 % , which significantly differ from the plants harve -sted with moisture 19-22% ,(95.59 g. plant $^{-1}$) and 25-28 % , (116.30 g. plant^{-1}). After those two treatments , the vegetative mass was decreased (Figure 1). It could be concluded that the best harvesting moisture to get highest vegetative mass , was (25 - 33) % ..

Total dray matter g. plant $^{-1}$:

Significant difference were found among harvesting grains in different moisture levels concerning total dray matter g. plant . day^{-1} for the next , (Table 1). The highest value 269 g.plant^{-1} of this trait was produced from the plants grown from the seeds which harvested with grain moisture 25-28% , but this treatment didn't differs significantly from the 19-22 % , which produced 255 g. plant^{-1}. The Figure 2 shows a linear decay curve between grain harvesting moisture and total dray matter crop g. plant . with R^2 = 72.70. It could be concluded that the favorable moisture for corn grains harvesting for seeds production to get highest total dray matter gplant^{-1}, was 25-28% .

Total dray matter. kg. m^{-2} :

Table 1 shows significant differences among corn grains moisture during harvesting times at seeds production times and their effects on the crop dray matter.m^{-2} for the next generation. The grains moisture treatment 25-28 % produced highest (1.80 kg.m^{-2}) corn plants dray matter m^{-2} , which didn't significantly differ from both treatments 19-22% and 30 – 33 % , which produced 1.71 and 1.66 kg.m^{-2} , respectively . Figure 3 , indicates decay linear curve with R^2 = 72.% . It could be conclude that the best time for corn grain harvesting for seeds production program was between 19-28 % harvesting moisture and with increasing from this level it caused a decreasing the total dray matter kg.m^{-2} . in corn production.

Grain yield. kg.m^{-2} :

Significant differences were found among grain moisture harvesting for corn grain yield of the second generation (Table 1). The highest grain yield (1.07 kg.m $^{-2}$) produced from plants , their seeds harvested , when the moisture was 19-22 % . While the lowest grain yield (0.82 kg .m^{-2}) was produced from the plants grown from seeds harvested with moisture 37-42 % . Figure 4 indicates a linear regression of grain yield to harvesting moisture with R^2 = 90.2. It can be conclude that when corn plants are cultivate for seed production , then should be harvested when the grains moisture don't exceed 22% .

Harvest Index :

The results of the Table 1 reveal that the differences among grains moisture at harvesting of seed parents were significant . The highest harvest index (0.63) was produced from harvesting the grains at moisture 19-22 % , which didn't differ from the grains moisture 25-28 % , while , the harvest index declined with increasing grains moisture (Figure 5). It could be conclude that the best time for harvesting grains , which could be use as seeds for next generation do not exceed from 28% .

It can be conclude , that when corn plants are cultivate for seeds production to the next generation , should be harvested when grain moisture don't exceed 22% .

Table 1. Means of vegetative mass g. plant^{-1} , total dray matter g. plant^{-1} , total dray matter kg. m^{-2} , grain yield kg.m^{-2} and harvest index .

Grain moisture %	Vegetative mass g.plant^{-1}	Total dray matter g.plant^{-1}	Total dray matter kg.m^{-2}	Grain Yield kg.m^{-2}	Harvest index
19-22	95.59	255	1.71	1.07	0.63
.25-28	116.30	269	1.80	1.02	0.58
30-33	118.52	248	1.66	0.87	0.52
34-36	54.58	242	1.62	0.86	0.53
37-42	56.98	216	1.44	0.82	0.57
LSD	31.62	32	0.22	0.05	0.08

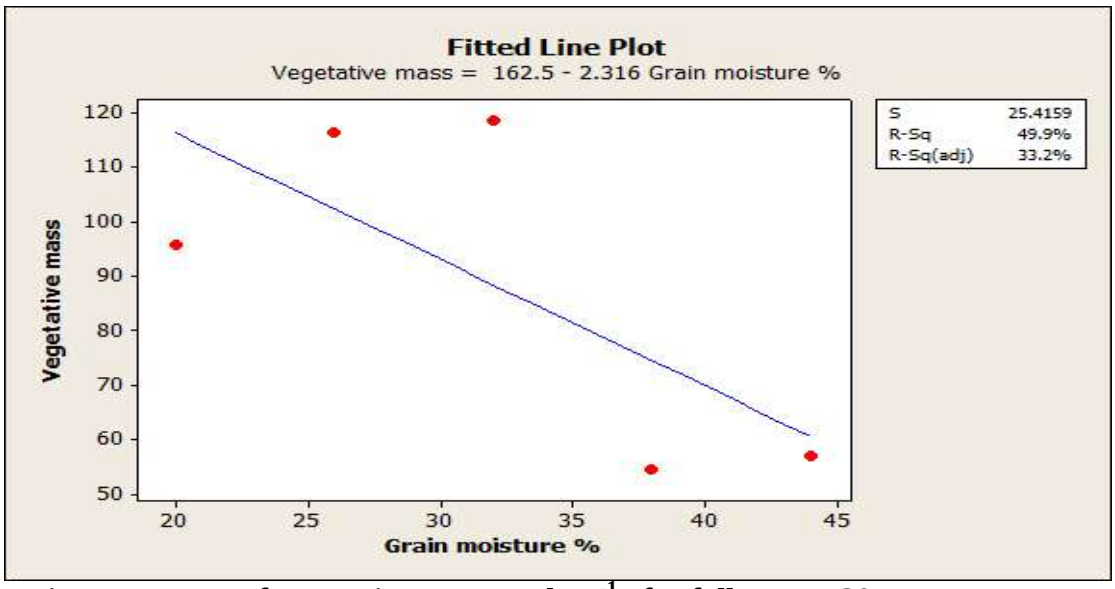

Figure1.Means of vegetative mass g. plant^{-1} , for fall season 2015.

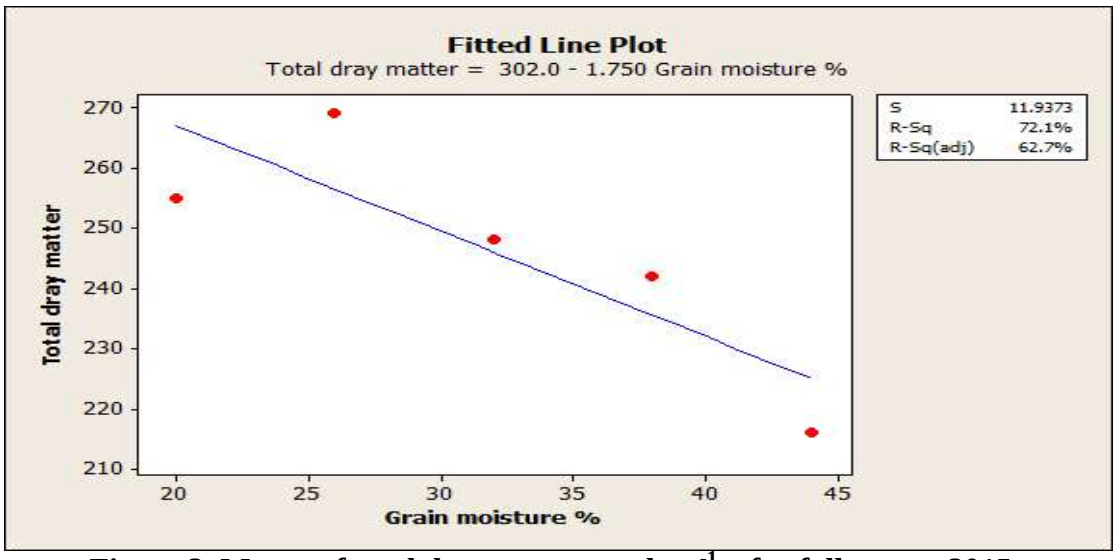

Figure 2. Means of total dray matter g. plant^{-1} , for fall season 2015 .

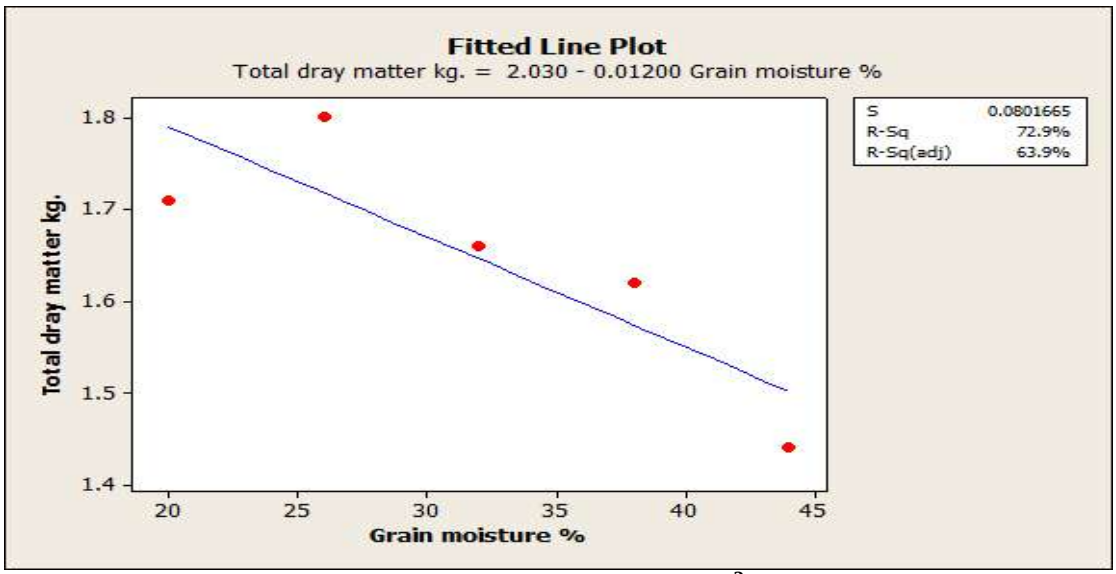

Figure 3. Means of total dray matter kg. m^{-2} , for fall season .

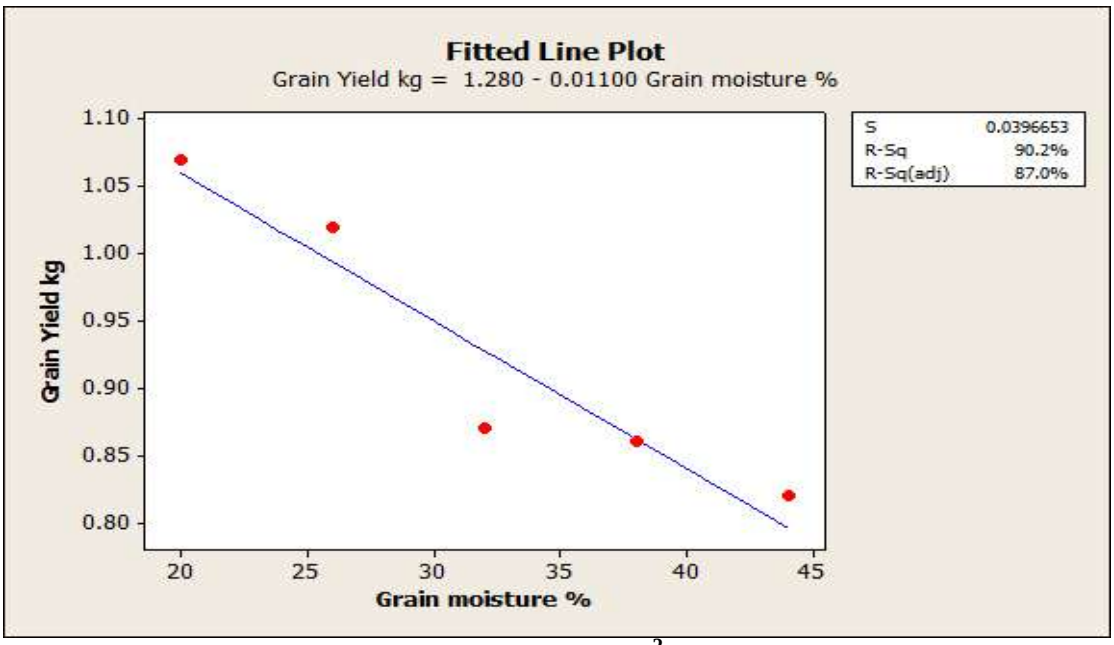

Figure 4 . Means of grain yield kg.m^{-2} , for fall season 2015.

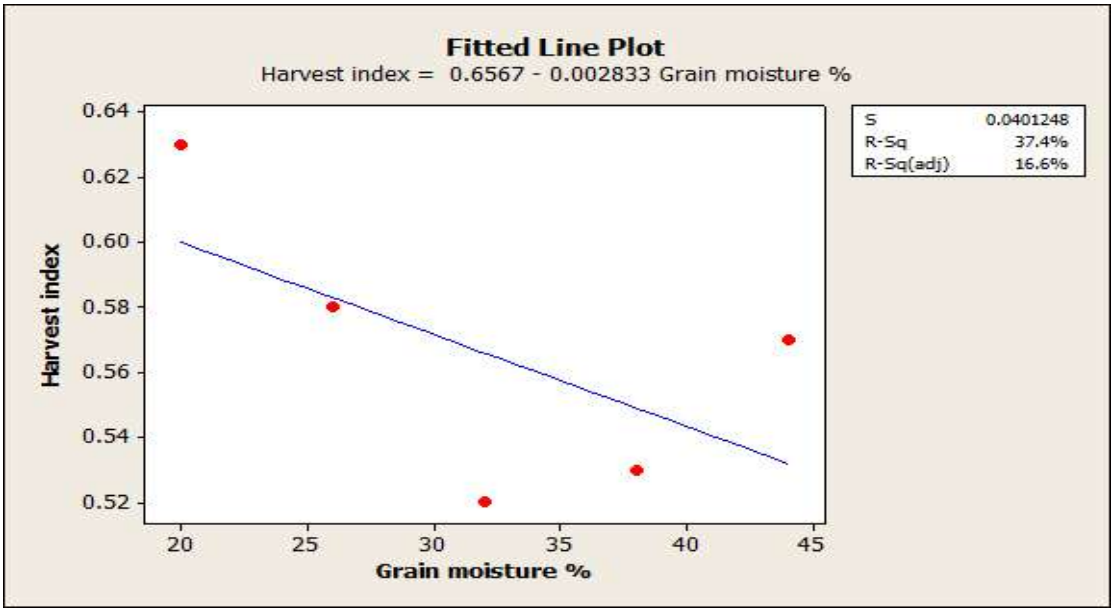

Figure 5. Means of harvest index . for fall season 2015 .

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