Estimation of grain yield and its components for two cultivars of bread wheat (Triticum aestivum L.) in two rainy regions in Nineveh.

Al-Hubaity, Aymen Taher [1], Abdullsattar Asmair Alrijabo [2], Moyassar Mohammed Aziz [3]

[1]Nineveh Directorate of Agriculture - Ministry of Agriculture

[2] College of Agriculture and Forestry, University of Mosul

[3]College of Agriculture and Forestry, University of Mosul

Abstract

An experiment was set up in season 2020-2021 in two locations in Nineveh upon two varieties of bread wheat (*Triticum aestivum* L.) who are (Ipaa99 and Abo-Ghraib3). The research was carried in Moderate Rainfall Area locations in (Nemruod and Telkaif). The experiment implemented through December the (10th-20th) 2020 in all locations. Field inspection was applied and estimating the outcome before and after harvest. The study consist of two factors first of them was Field Inspection models in Four levels (Circle, spiral, cross, and random) Suggested by the Food and Agriculture Organization. Second factor the Bread Wheat species which was two levels (Ipaa99 and Abo-Ghraib3) produced in Al-Iraqia Company for seed production in Nineveh. The study was replicated in all experiment locations.The randomized complete Block Design (R.C.B.D) was used in this study. Data analysis was obtained according to program (SAS), using Duncan method was implemented to compare between the means of the treatments for varieties in each location. Results showed as flowing:

1- Identify the most appropriate model for field inspection: The most appropriate model for field inspection in grain yield estimation which was close to farmer grain yield for (Ipaa99 and Abo-Ghraib3) cultivars in Nineveh fields was the Circle model where the counters that was same to farmer grain yield consecrated in the outer border of the field, this confirms Darweesh (2011) that the Circle model is the most efficient in determining number of spikes.m^{-2}

2- Spikes numbers trait of the two cultivars in field inspecting for all model types and for all various environmental locations: The results showed that there were no significant differences in the values of the number of spikes for the three models compared with the circular model for both locations that included field inspection for the two studied cultivars Ipaa 99 and Abu Ghraib

Introduction

wheat (*Triticum aestivum* L.) is one of the strategic crops grown in Iraq in general and in Nineveh in particular because of the large area in which this crop is grown, which amounts to about six million dunams (according to the statistics of the Ministry of Agriculture) distributed over the areas high rain and middle rain. This is in addition to its role in producing bread and achieving food security, which is one of the most important basic sources of energy needed by humans. Field inspection considered as an important activity during seed certification, where the adoption of seeds is an approved system that aims to control the quality, of seed production through inspection of fields and silos and field monitoring before and after harvesting operations, then testing the quality of seeds (12). There are standards which controls field inspection that the inspector depend on it to follow up on each plant type within the ranks. Without these standards, the field inspector will depend on his own experience, which differ from person to another, which leads to large

variations in the quality of the yield due to the use of personal standards by each field inspector. in the accept or reject field. However, with the presence of standard criteria for each cultivated plant type and for each rank of seed, the results of the field inspection for all inspectors will be the same (19). (3) discussed the subject of field inspection and how to conduct it and mentioned the models of field inspection. Researchers referred to the ten units (meters) for each type of field inspection, and then mentioned some international specifications for some varieties of grains and legumes. (14) mentioned these models, suggesting them for the field inspector upon inspection, referring the ten field meters (each meter one square meter), For each of these four models with an indication of the efficiency of each model in estimating the result. (11) concluded that the most appropriate field inspection model for estimating the grain yield is the model in which the results of estimating the yield within its counters (ten units) matched the results of harvest without significant differences. A new field inspection model was found out From the results of the study, which is the circular model (Darwish-Rajabo, extrapolated model 2011)from its compatibility when estimating the yield with all the yield of experimental wheat and for all environmental locations and achieving the highest compatibility with the harvested grain yield for all locations compared to the traditional models. Rain and its distribution affect the growth and yield through the amount of water from rain or supplemental irrigation. The variance in the amounts of rain leads to the difference in yield from region to another, and it was also found that there is a relationship between the amount of rainfall and wheat production. While the climate in Iraq changed in recent period like, rising temperatures and a lack of rain (6). Number of spikes considered as one of the yield components from the three-grain yield if the size of the grain and the number of grains in the spike are added (27).The spike plays an

important role in adapting to the conditions of abiotic environmental stresses such as drought and high temperature, where it participates in a greater proportion than the rest of the other plant parts in the photosynthesis process under these conditions (29),(1), reported that the yield of wheat was significantly reduced when the crop was exposed to drought conditions in the post-flowering stages, which led to a decrease in grain weight. (24) showed that drought with high temperatures at late planting dates reduces number of $spikes.m^{-2}$ and accelerates the senescence process of tillers, causing lower grain yields.

Materials and methods

The research was conducted in season 2020-2021 in four fields, two fields for each variety, (Abo-Ghraib3) and (IPA 99) in two locations of semiarid area (Nemroud and Telkaif), where the two varieties planted in separate fields in each location and the experimental unit was 50 dunem. Four models of field inspection were chosen to estimate the most appropriate model that achieves the highest yield that resembles the actual production of the field and represents the result of the yield. The inspection models included the spiral model (clockwise), the cross model, the random model, and the circular inspection model (inventor). Each model includes ten counters with an area of one square meter, then averages were adopted and the results of all traits were taken for the yield and its components at harvest The trait of the number of $spikes.m^{-2}$, was adopted in estimating the grain yield before harvest and comparing it later with the actual harvest quantity . The model that achieved compatibility between the estimated yield during field inspection and the actual yield at harvest was determined. Wheat grains were obtained from two seed production companies (the Iraqi Company and Mesopotamia Company) affiliated with the Ministry of Agriculture .The experiment was conducted according to the factorial experiment system (split-plot design) and with two factors, the first of which is the field inspection models,

and it included four types of field inspection (circular, spiral, cross, random). As for the second factor, it was represented by the two varieties of bread wheat (IPA 99 and Abo-Ghraib3), where the second factor adopted the cultivar factor in the main plots and the first factor adopted the four types in the subplots. The studied traits were statistically analyzed using the analysis of variance method and randomized complete block design (R.C.B.D) for a factorial experiment with three replicates. This experiment was conducted in the two study locations. Using the (SAS) program (8), with the adoption of Duncan's multi-range test to compare the different averages of treatments, and to study the traits of the yield and its components for the two cultivars and compare them for each location at the (0.05) Duncan (13) probability level.

Results and discussion

Estimation of trait of the yield components for the interaction of the two wheat cultivars with the inspection models of my two fields at the Nimrud location :

1- the number of spikes. m^{-2}

Table (1) show there are significant differences between the average of two cultivars in the number of spikes.m^{-2}, where Abo-Ghraib3 (297.958 spikes.m^{-2}) was significantly excellence on IPA 99 (252.375 spikes.m^{-2}) in this trait. While the highest value achieved in the cultivar Abo-Ghraib3 was (312.867 spikes.m^{-2}) with the cross model, These low values of the number of spikes m-2 are due to the fact that this location has the least rainy imports during the season compared to the Telkaif location, The decrease in the water content of the soil in the pre-flowering stages due to the lack of rain is the reason for the low value of this important traits, and this is consistent with what was mentioned (23), and Also, the cultivars differ in this trait according to the different environmental conditions according to the stage of plant growth, and this is what was supported by it (4).The reason for the variation in the number of spikes is the

increase in water stress, which led to the destruction of some tillers and a decrease in their number, as well as the effect of water stress in reducing the availability of nutrients (available photosynthetic products) during the stage of emergence and development of ribs initiators, which leads to increased competition for these materials and then Decrease in the number of spike-bearing shavings (7). Also, drought combined with higher temperatures at later planting dates reduces the number of spikes per square meter and accelerates the senescence process of the tillers, causing lower grain yields (24). It is also clear from the table that the four models did not differ significantly among themselves in the IPA 99 cultivar, which indicates the possibility of reading this adjective in any of the four models used. While the spiral model was not appropriate to read this trait in the variety Abo-Ghraib3 because of its significant difference from the cross model and not differing from the circular and random models.

2- The length of the spike. cm

Table (1) showed there are significant differences between the average of two cultivars in the trait of spike length, where Abo-Ghraib3 (5.776 cm) was significantly excellence on the cultivar IPA 99 (5.626 cm) in this trait. While the highest value achieved in Abo-Ghraib3 was (5.807 cm) with circular model. The reason for this is due to the exposure of wheat plants to water stress during the plant growth stages, starting from the stage of formation of the ribs to the stages of the heading of the spikes and flowering, which may lead to a reduction in the spike length and a reduction in the number of grains in it. This is consistent with (28). It is also clear from the table that the four models did not differ significantly between them in both verities, which indicates the possibility of reading this result in any of the four models used for both verities.

3- Number of grains. spike^{-1}

Table (1) showed there are significant differences between the average of the two

cultivars in the number of spike grains, where Abo-Ghraib3 (18,703 grains.spikes[-1]) significantly excellence on IPA99 (16,394 grains.spikes[-1]) in this trait. While the highest value achieved in the Abo-Ghraib3 cultivar was (19,533 grains.spike[-1]) with the cross model. The distinctiveness of the Abo-Ghraib3 cultivar significantly in this trait is due to its average distinction in the trait of the spike length, which relatively affects the trait of the grains number of the spike. The reason is that water stress caused by the lack of moisture as a result of the interruption of rain in the early stages of the growth of the wheat crop until flowering. It had a strong effect on the number of grains.spike[-1], in addition to the number of grains .spike[-1] is one of the three important components that have a direct effect on the grain yield, which is affected by the genetic nature of the plant as well as the environmental factor that affects the increase in the number of grains in the number of spikes and this is consistent with (22) and (18). Also the table show that the four models did not differ significantly in both varieties, which indicates the possibility of Apply this feature in any of the four models used.

4- the weight of 1000 grains. (g)

Table (3) showed there are significant differences between the average of the two varieties in the trait of weight 1000 grains.gm, where the cultivar Abu Ghraib3 (19.178gm) significantly excellence on the variety IPA 99 (16,852gm) in this trait. While the highest value achieved in the cultivar Abu Ghraib3 was (19.865 g) with the cross model, the decline in this trait may be due to the decrease in rain in addition to the raise in temperature which caused a shorthand in seed filling period, so affect on production of photosynthesis processes (2). Table shows that there are no significant differences between the four models in IPA99 which refer to the efficiency of the models whether in field inspection or the study of the yield and its components, however the cross

model differ significantly from other models in Abu Ghraib3

Estimation of yield characteristics in two wheat cultivars overlap with field inspection models at Nimrud location:

1- Grain yield (gm.m[-2])

Table (2) in the trait of grain yield.m[-2] showed there are significant differences between the average of the two cultivars, where Abo-Ghraib3 (99.445 g.m^{-2}) significantly excelled on the cultivar IPA99 (58.701 g.m^{-2}) in this trait. While the highest value achieved in the variety Abo-Ghraib3 cultivar was (107.154 g.m^{-2}) with the cross model, the distinction of the variety Abo-Ghraib3 over the cultivar IPA99 in this trait is due to significantly excellence in the trait of the three components of the yield, which is the number of spikes and the number of grains spike, and the weight of 1000 grains. The reason is that this trait is greatly affected by the genetic structures of the cultivars in addition to the environmental conditions. The grain yield is also positively correlated with the availability of water for the crop from the seed to dough stage. The grain yield is also affected by the water availability for the crop from seeding to the grain formation phase, as the water stress in the late stages of the growth of the yield becomes more harmful to the grain yield than in the early stages(10) and (23). Also there is no significant difference in the weight of the product between the four models in the IPA 99 cultivar, which indicates the possibility of this trait in any of the models. While the spiral model differ significantly in IPA99 , while the table indicates that there is no significant difference between the circular, spiral and random models of Abo-Ghraib3 and their significant difference from cross model and close to the average grain yield.

Table (1) estimation of yield components for the two varieties of bread wheat and for different inspection models at Nimrud location

cultivar	model	Weight 1000 grain(g)	Number of grains per spikes $^{-1}$	spike length cm	Number of spikes.m^{-2}
IPA 99	circular	16.928 c	16.6 b	5.580 a	248.467 c
IPA 99	spiral	16.457 c	16.297 b	5.517 a	252.433 c
IPA 99	cross	16.965 c	16.2 b	5.503 a	252.3 c
IPA 99	random	17.061 c	16.48 b	5.506 a	256.3 c
Abo-Ghraib3	circular	18.744 b	18.473 ab	5.807 a	294.333 ab
Abo-Ghraib3	spiral	19.343 ab	18.65 ab	5.761 a	284.067 b
Abo-Ghraib3	cross	19.865 a	19.533 a	5.813 a	312.867 a
Abo-Ghraib3	random	18.761 b	18.157 ab	5.724 a	300.567 ab
IPA99 average		16.852 b	16.394 b	5.526 b	252.375 b
Abo-Ghraib3 average		19.178 a	18.703 a	5.776 a	297.958 a

2- The hay weight g.m^{-2}

Table (2) showed there are significant differences between the average of two cultivars in the straw weight trait, where Abo-Ghraib3 (197 g.m-2) was significantly excellence on IPA99 (177 g.m^{-2}) in this trait, while it was higher The achieved value in the variety Abo-Ghraib3 is (200 g.m^{-2}) with a spiral model. The distinctiveness of the Abo-Ghraib3 cultivar in this trait is due to its excellence in height of the plant and all the traits of the components of the product of the cultivar IPA 99.Water stress at the beginning of plant growth leads to inhibition of seed germination and delay of seedling emergence compared to normal conditions. It also leads to a reduction in plant height, number of leaves and buds, growth and expansion of

leaves and maturity, which negatively affects the process of photosynthesis, production and accumulation of dry matter and this is consistent with what he (21).It is also obvious from the table that the four models did not differ significantly in each variety, which indicates the efficiency of the four models in measuring this trait, whether in the field inspection or in studying the trait of the yield and its components.

3- The bio weight (gm.m-2)

Table (2) showed significant differences between the average of the two cultivars in the bio weight kg.m^{-2} the Abo-Ghraib3 cultivar (283 g.m-2) was significantly excellence on IPA99 (234 g.m^{-2}) in this trait. While the highest value achieved in the Abo-Ghraib3 was (290

g.m-2) with the spiral model. This can be explained by the differences in the genetic structures between varieties in addition to the environmental conditions such as rain retention, high temperatures and the plant's exposure to water stress (drought) early before the completion of its life cycle, which leads to a reduction in the number of shoots and a decrease in the height of the plant and this It agrees with what (5) found, and this was also referred by (15).

4- Harvest Index %
Table (2) showed there are significant differences between the average of the two cultivars in the trait of harvest index %, where Abo-Ghraib3 cultivar (35.775%) was significantly excellence on IPA 99 (25.096%) in this trait. While the highest value achieved in the Abo-Ghraib3 cultivar was (39.136 %) with the cross model, and this is due to effect of this trait by drought during the vegetative growth stage and the grain filling period, so the increase in carbohydrate conservation during the period between vegetative growth and grain filling period is beneficial. Especially in dry environments, this is also supported (26).It is also obvious from the table that the four models did not differ significantly IPA99, which indicates the efficiency of the four models in measuring this trait of the cultivar, whether in the field inspection or in the study of the trait of the yield and its components. While the cross model was not appropriate to read this trait in Abo-Ghraib3 because of its moral difference from the rest of the models.

5- Specific weightkg.hl^{-1}
Table (2) in the test weight trait showed there are significant differences between the mean of the two varieties, where Abo-Ghraib3 (79.143 kg.hl^{-1}) significantly excellence on the IPA99 (73.150 kg.hl^{-1}) in this trait, While the highest value achieved in the Abo-Ghraib3 was (79,784 kg.hl^{-1}) with the cross model, The distinction of Abo-Ghraib3 in this trait is due to its significantly excellence in the trait of the weight of 1000 grains, which is highly correlated with

the trait of test weight. This is due to the fact that water stress leads to the heterogeneity of the grain size in the spike, so its size increases in the middle of the spike and decreases at its base, and this is what is between it (30).It is also obvious from the table that there are two types of field inspection models that did not differ significantly between them with the Abo-Ghraib3 cultivar, and the only cross model achieved a high value of the test weight, The best result was in Abo-Ghraib3 is achieved in the circular and spiral models. While the significant difference between the models was absent for the value of the test weight average in the IPA 99 cultivar, which indicates the efficiency of the four models in measuring this trait, whether in the field inspection or in the study of the trait of the yield and its components.

Estimation of the traits of yield components for the two wheat cultivars with field inspection models at Telkaif location:

1- The number of spikes. m^{-2}
Table (3) showed there are significant differences between the average of the two cultivars in the number of spikes.m^{-2}, whereby Abo-Ghraib3 (306,866 spikes.m^{-2}) was significantly excellence on IPA99 (217.192 spikes.m^{-2}) in this trait. While the highest value achieved Abo-Ghraib3 cultivar was (331.567 spikes.m^{-2}) with a random model, and the reason for low number of spikes per m^2 in Telkaif location may be attributed to lack of rain during the season. The water stress during the vegetative phase leads to a reduction in the leaves area and number of tillers-bearing spikes in wheat, and exposing the wheat plant to lack of water during the phases of emergence, elongation or the beginning of the tillers formation phase leads to a significant reduction in the number of spikes per unit area, and this It agrees with what he found (32). It is also obvious from the table that the four models did not differ significantly among themselves in the

IPA99 cultivar, which indicates the possibility of showing this trait in any of the four models used. While the random model was not appropriate to read this trait in the Abo-Ghraib3 cultivar because it is significantly different from the rest of the models.

Table (2) estimation of yield traits for two types of bread wheat and for different inspection models at Nimrud location

cultivar	model	Specific weight kg. hl^{-1}	Harvest Index %	bio weight (g.m-2)	straw weight (g.m^{-2})	Yield weight (g.m-2)
IPA 99	circular	72.96 d	24.939 c	243 b	184 ab	60.252 c
IPA 99	spiral	72.964 d	24.467 c	223 b	169 b	54.961 d
IPA 99	cross	73.310 d	25.546 c	226 b	173 b	58.042 c
IPA 99	random	73.368 d	25.435 c	244 b	185 ab	61.549 c
Abo-Ghraib3	circular	79.244 b	33.864 b	281 a	197 a	95.292 b
Abo-Ghraib3	spiral	79.179 b	34.479 b	290 a	200 a	98.621 b
Abo-Ghraib3	cross	79.784 a	39.136 a	286 a	197 a	107.154 a
Abo-Ghraib3	random	78.366 c	35.621 ab	278 a	195 a	96.713 b
IPA99 average		73.150 b	25.096 b	234 b	177 b	58.701 b
Abo-Ghraib3 average		79.143 a	35.775 a	283 a	197 a	99.445 a

2- The spike length (cm)
Table (3) showed there are significant differences between the average of two cultivars in the trait of spike length. , where the cultivar Abo-Ghraib3 (5.676 cm) was significantly excellence on the cultivar IPA 99 (5.207 cm) in this trait, while the highest value achieved in the cultivar Abo-Ghraib3 was (5.781 cm) with the cross model. The reason for the different cultivar in the spike length may be due to their difference in the length of the growth period that extends from the beginning of elongation until it reaches 100% flowering, and to the difference in its genetic structure , and this is consistent with what was mentioned (25).It is also clear from the table that the four models did not differ significantly among themselves in each category, which indicates the possibility of reading this trait in any of the four models used, whether in the field inspection or in studying the traits of the yield and its components.

3- The number of grains per spike
Table (3) show that there are significant differences between the average of the two cultivars in the trait of number of grains per spike, where Abo-Ghraib3 (19,424 grains.spike^{-1}) significantly excellence on cultivar IPA99

(15,682 grains.spike^{-1}) in this trait. While the highest value achieved in the cultivar Abo-Ghraib3 was (20.19 grains. spike-1) with the cross model. The distinction of the cultivar Abo-Ghraib3 in the number of grains per spike may be due to its significantly excellence in the length of spike on the cultivar IPA99 .The low value of the number of grains per spike at the Telkaif location may be due to the scarcity of rain and the decline in the water content of the soil .This leads to reducing the transformation of the vegetative tillers into fertile tillers (spike) due to the lack of available photosynthetic products, Which negatively affects the number of spikes formed per area unit, and then the decrease in the number of grains and the decrease in grain productivity, and this is consistent with what mentioned (29). It is also obvious from the table that the four models did not differ significantly in the IPA 99 cultivar , which indicates the possibility of showing this trait in any of the models. While there was no significant difference between the circular model and the other three models, which indicates the possibility of showing this trait in any of the four models used, whether in the field inspection or in studying the traits of the yield and its components.

4- the weight of 1000 grains. (g)

Table (3) showed   there are significant differences between the average of the two cultivars in the trait of weight 1000 grains.gm, where the cultivar IPA 99 (18.63gm) significantly excellence on the Abu Ghraib3 (16,620gm) in this trait. While the highest value achieved in the IPA 99 was (19.154 g) with the random model, the decline of Abo-Ghraib3 in this trait may be due to the increase in the number of spike grains compared to IPA 99 and the water stress during the cultivation season in TelKaif made providing the nutritional requirement for more grains in spike more difficult than it in spikes with few grains as it is in IPA 99, as a result IPA 99 excellence in this trait and the reason for the low value of this trait

in this location may be due to the scarcity of rain and the high temperature in the flowering stage, which leads to an acceleration of the process of filling the grains, and this negatively affects the weight of 1000 grains and leads to a decrease in the size of the grains, and this is consistent with what he found (9). Also the table shows that the four models did not differ significantly in Abo-Ghraib3 , which indicates the efficiency of the four models in measuring this trait, whether in field inspection or in studying the trait of the yield and its components. While the cross model differed significantly in IPA99 from the spiral and random model.

Estimation of the yield traits of the two wheat cultivars interaction with the field inspection models at Telkef location:

1- Grain yield (gm.m^{-2})

Table (4) shows a significant differences between the average of the two varieties, where Abo-Ghraib3 (89.172 g.m-2) significantly excellence on IPA 99 (64.705 g.m-2) in this trait While the highest value achieved in Abo-Ghraib3 was (94,348 g.m-2) in cross model, Abo-Ghraib3 excellence in grain yield is due to its excellence in the number of spikes.m-2 and grains number/ spike compared to IPA 99, This difference related to genetic efficiency of the variety in producing the dry matter from photosynthesis to contribute to the construction and filling of grains, however water stress in the semiarid areas limits the response of yield and leads to a significant decrease in the trait of the grain yield of wheat. (1). Table also showed that there is no significant difference in yield weight between the four models in IPA 99, While the circular and cross models significantly excellence in this trait in Abo-Ghraib3 because of their significant difference from the random and spiral model.

Table (3) Estimation of yield components traits for two varieties of bread wheat and for different inspection models at Telkaif location

cultivar	model	Weight of 1000 grain (g)	number of grains per spike	spike length (cm)	number of spikes.m^2
IPA 99	circular	18.471 b c	15.246 d	5.245 b	213.467 c
IPA 99	spiral	18.855 ab	15.323 d	5.182 b	208.267 c
IPA 99	cross	18.040 c	16.633 c	5.249 b	217.667 c
IPA 99	random	19.154 a	15.526 c d	5.153 b	229.367 c
Abo-Ghraib3	circular	16.501 d	19.04 ab	5.626 a	292.5 b
Abo-Ghraib3	spiral	16.868 d	19.79 ab	5.702 a	306.133 b
Abo-Ghraib3	cross	16.518 d	20.19 a	5.781 a	297.267 b
Abo-Ghraib3	random	16.594 d	18.676 b	5.598 a	331.567 a
average IPA 99		18.63 a	15.682 b	5.207 b	217.192 b
Abo-Ghraib3 average		16.620 b	19.424 a	5.676 a	306.866a

2- Hay weight g.m-2

Table (4) showed there are—significant differences between the average of the two cultivars in the straw weight trait, where Abo-Ghraib3 (210 g.m-2) was significantly excellence on IPA 99 (207 g.m-2) in this trait. While the highest value achieved in the cultivar Abo-Ghraib3 was (220 g.m-2) with the spiral model, the Abo-Ghraib3 excellence on the IPA 99 cultivar in the straw weight trait because the dry matter produced by the plant during the growing season resulted from the difference between the two processes of representation Photosynthesis and respiration ,environmental factors affect these two processes, and the difference in temperatures affects the variation in the dry weight of plant component This is consistent with what was mentioned (17). Inadequate conditions also lead to a decrease in the accumulation of dry matter of the plant due to lack of vegetative growth related to the number of branches, plant height and leaf area and then reduce the interception of solar rays and reduce the conversion of this energy into chemical energy as a result of increased respiration, as confirmed by (33).It is also clear from the table that there is no significant difference between the circular model and the spiral and random models, as the cross model was unique in that it was not possible to read the adjective in the variety IPA 99While there was no significant difference between the circular model and the other three models, which indicates the possibility of reading this trait in any of the four models used, whether in the field inspection or in studying the characteristics of the yield and its components.

3- Bio weight (gm.m-2)

Table (4) shows a significant differences between the average of the two varieties in the trait of bio weight kg.-2, where Abo-Ghraib3 (300 g.m-2) was significantly excellence from IPA 99 (278 g.m-2) in this trait. While the highest value achieved in Abo-Ghraib3 was (313 g.m-2) at the spiral model, Abo-Ghraib3 excellence in the bio weight is due to its

excellence in number of spikes.m-2, hay weight, and grain yield .The reason of decreasing in bio-weight in the experiment of Telkaif location may be due to the lack of water which impact on the crop growth, as well as the high temperatures that cause a shortage of the growth period and a shorter period of photosynthesis as a result of the maturity of the plant, so the accumulation of dry matter decreases. This affect negatively on the biological yield of the plant, (31). also the table shows there are no significant differences in the four models at IPA99, except the cross model which is significantly differed from the circular model, while all models didn't differ significantly from the circular at Abo-Ghraib3

4- Harvest Index %

 Table (4) showed a significant differences between averages of the two varieties in the trait of Harvest Index %, where Abo-Ghraib3 (29.622%) was significantly excellence on IPA 99 (23.601%) in this trait, while the highest value achieved in Abo-Ghraib3 was (30.302 %) with cross model Harvest index is an important factor in estimating the grain yield through different varieties of wheat at high temperature conditions and water scarcity (20). the table also shows that there are no significant differences for the four models in the two varieties , which indicates the efficiency of the four models in measuring this trait, whether in the field

inspection or in studying the yield and its components.

5- Specific weight (kg.hl-1)
Table (4) show there are significant differences between the average of the two cultivars, where the cultivar IPA99 (78.021 kg.hl-1) significantly excellence on Abo-Ghraib3 (76.54 kg.hl^{-1}) in this trait, while the highest value achieved in IPA99 was (78.671 kg.hl^{-1}) with cross model. The reason for the low value of the specific weight may be due to the fact that drought accompanied by a rise in temperature accelerates the senescence process of the plant, which causes a decrease in grain yield due to the short period of filling the grain. This is consistent with what was mentioned (24). It is clear from the table that there are two types of field inspection models that did not differ significantly between them with the cultivar IPA 99, which achieved the highest value of the test weight, at the circular and cross model, which agreed with the average of this trait. also the table shows that there are two models of field inspection did not differ significantly at Abo-Ghraib3, achieving the highest value of the specific weight, circular and random model, which agreed with the average of this trait in the cultivar .

Table (4) Estimation of yield characteristics for the two types of bread wheat and for different inspection models at Telkaif location

cultivar	model	specific weight kg. hl-1-	Harvest Index %	bio weight (g.m-2)	straw weight (g.m^{-2})	Yield weight (g.m-2)
IPA 99	circular	78.328 a	23.082 b	295 a b c	219 a	66.648 c
IPA 99	spiral	77.713 b	22.814 b	281 c d	210 ab c	62.916 c
IPA 99	cross	78.671 a	24.231 b	262 d	195 c	63.268 c
IPA 99	random	77.373 b	24.278 b	277 c d	204 a b c	65.991 c
Abo-Ghraib3	circular	77.292 b	29.438 a	290 a b c	204 a b c	85.483 b
Abo-Ghraib3	spiral	76.480 c	29.330 a	313 a	0.220 a	92.342 a
Abo-Ghraib3	cross	75.170 d	30.302 a	311 ab	216 ab	94.348 a
Abo-Ghraib3	random	77.220 b	29.419 a	286 b c d	201 b c	84.517 b
average IPA 99		78.021 a	23.601 b	278 b	207 b	64.705 b
Abo-Ghraib3 average		76.54 b	29.622 a	300 a	210 a	89.172 a

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