Study of inter correlation among yield and its components of some genotypes of bread Wheat (*Triticum aestivum* L.)

Labeed. SH. Mohammed

University of Tikrit , College of Agriculture , Field Crop Dept. Salah alldin , Iraq

Abstract:

Four cultivars and three mutants of bread wheat were grown in the experimental field in Tuwaitha, Baghdad-Iraq in 2001-2002. Simple, partial and multiple correlations were calculated among the characters studied. Stepwise regression procedure was used to determine the most correlated character with yield. The results showed that the Kernels number/spike were positide positive correlated with the yield, while correlation between yield and plant height was negative significantly. Yield was positively correlated with kernel weight and negatively with number of spike/m^2. Partial and multiple correlations revealed that kernels number/spike had the higher correlation with yield, and stepwise regression showed that kernels number/spike was the most effective character on yield.

Introduction:

The grain yield of cereal crops is influenced by its components, which act together to contribute to the ultimate seed yield. As high yield is the main objective of a breeder, it is necessary to find out the relationship of these components with yield (Okuyama et al, 2004). Grafius (1960) suggested that individual yield component may contribute valuable information in breeding for yield, leading to select important characters on the basis of genotypic association of the traits which are highly correlated (Singh, 1982). Johnson,etal (1966) emphasized that increases in yield levels are progressively more difficult to obtain and that evaluation of individual yield component might provide better basis for progeny evaluation than yield itself. The relationship among yield and its components has been studied by many workers and on different materials. Past experimental data shows correlations between yield and measurable agronomic traits in wheat, including number of grains/head (Calderini et al., 1995; Wang et al., 2002), number of tillers (Reynolds *et al.*, 1999; Wang *et al*., 2002), kernel weight (Hucl and Baker, 1987; Wang et al., 2002).

The objective of the present study was to find out correlations among grain yield and its components, of some cultivars and mutants of bread wheat,(*Triticum aestivum* L.) and to select more effective character which may contribute to yield improvement.

Materials and Methods:

The experiment was conducted in 2001-2002 under Tuwitha, Central region of Iraq conditions using cultivars of bread wheat, Mexipak , Noori - 70 , Abu - Ghraib - 3,Abu - Ghraib – 4 and mutants B-117, A-70 and B-13 at (M9). The mutants were induced by treating seeds of the local cultivar "Ajeeba" with the chemical mutagen sodium azide. The layout of the experiment was according to a randomized complete block design with three replications. Each plot consisted 10 rows of 5m long and 0.3 m between rows. At maturity period, number of spikes/m^2 ,

plant height,weight of kernel and number of kernels per spike for 10 Plants taken randomely from each plot were counted. Plants in the center eight rows were harvested for yield determination. Simple, partial and multiple correlations were calculated among all characters studied. Stepwise regression procedure was also used to determine the highly contributing character to yield (Steel and Torrie, 1960).

Results and Discussion:

Mean values of the tested characters are given in table (1). Significant differences among various cultivars and mutants existed for all characters. Simple correlation analysis (Table 2) revealed a positive significant correlation (r=0.826) between yield and number of kernels/ spike and with agreement of the results reported by Kumar and Dubey (2001), García del Moral *et al*. (2003), Okuyama et al (2004) and Wang et al. (2002). Plant height showed a high significant negative correlations with yield (r=-0.478). this result agree with previous reports from Jain and Kulshresthat (1976) whoes they obtained a significant increase in grain yield with reduction in plant height. Also obtained significant negative correlation between plant height and No.of kernels / spike (-0.466).

Path analysis appears to be a useful tool for understanding grain yield formation and provides valuable additional information for improving grain yield via selection for its yield components. Partial correlations revealed that yield was significant positively correlated with number of kernels when each of the other characters was kept out (Table3). But yield was negatively significant correlated with plant height when the effect of number of spikes/plant or weight of kernel was excluded. Therefore, it is evident from these results that number of kernels/spike had more effect on yield than other characters, since it showed strongest association with yield, and wherever this character was excluded there appeared lower or non-significant relationships. The highest multiple correlation coefficient (0.833) was observed between yield and number of kernels/spike with number of spikes/m^2 (Table 4). This indicates that the yield variability is due to the combination of these two characters. While the correlation of number of spikes/m^2 with plant height and weight of Kernel was the lowest (0.244). Such results revealed that wherever number of kernels was used in calculating multiple correlation along with other characters, higher coefficients were obtained. This indicates that number of kernels/spike contributes mostly toward the yield. This result is similar from that presented in simple analysis of correlation.

Stepwise regression (Fig 1) showed that number of kernels was the most important character and had the strongest effect on yield according to the equation:

$\hat{Y}= 253.9 + 14.8x$

It was therefore concluded that number of kernels/spike serve as the best selection criterion for yield improvement potential in the test genotypes.

***Table 1*. Mean values for different characters of wheat varieties and mutants**

Genotypes	Grain yield (kg/ha) (1)	No. of spikes/ m^2 (2)	Plant height (cm) (3)	No.of kernels /spike (4)	Weight of kernel (gm) (5)
Mexipak	3114.92	353	107.10	65.360	0.032
Noori-70	2160.48	372	103.60	60.487	0.041
Abu-Ghraib-3	2371.36	432	100.86	58.387	0.030
Abu-Ghraib-4	1982.96	423	93.16	45.580	0.032
B-117	1469.19	488	127.03	44.500	0.033
B-1 3	1252.23	403	125.63	40.380	0.024
A-70	2847.68	402	105.46	64.387	0.030
LSD 0.05	177.19	74.00	6.40	6.016	0.004
LSD 0.01	248.02	n.s	8.96	8.421	0.006

n.s= non significant

***able 2*. Simple correlation coefficient among yield and its components in seven genotypes of bread wheat.**

Characters	No. of spikes/ m^2	No. of kernels/ spike	Weight of kernel (gm)	Plant height (cm)
Yield	-0.271	0.826**	0.339	-0.478**
No. of spikes/ m^2		-0.449	-0.155	0.230
No. of kernels/ spike			0.326	-0.466*
Weight of kernel (gm)				-0.371

***significant at 0.05 level, ** significant at 0.01 level**

Table3. **Partial correlation coefficient between yield and its components in seven genotypes of bread wheat.**

Characters	Partial correlation coefficient	Characters	Partial correlation coefficient	Characters	Partial correlation coefficient	Characters	Partial correlation coefficient
r12.3	-0.187	r14.2	0.819**	r15.2	0.312	r13.2	-0.443**
r12.4	0.198	r14.3	0. 771**	r15.3	0.198	r13.4	-0.186
r12.5	-0.235	r14.5	0.805**	r15.4	0.130	r13.5	-0.403**

***significant at 0.05 level, ** significant at 0.01 level**
1= grain yield, 2= number of spikes/ m^2, 3= plant height, 4= number of kernels/ spike,
5= weight of kernel

Table4. **Multiple correlation coefficients between yield and its components in seven genotypes of bread wheat.**

Characters	Multiple correlation coefficients	Characters	Multiple correlation coefficients
R1.23	0.505*	R1.45	0.520**
R1.24	0.833**	R1.25	0.404
R1.34	0.45	R1.35	0.244

***significant at 0.05 level, ** significant at 0.01 level**
1= grain yield, 2= number of spikes/ m^2, 3= plant height, 4= number of kernels/ spike,
5= weight of kernel

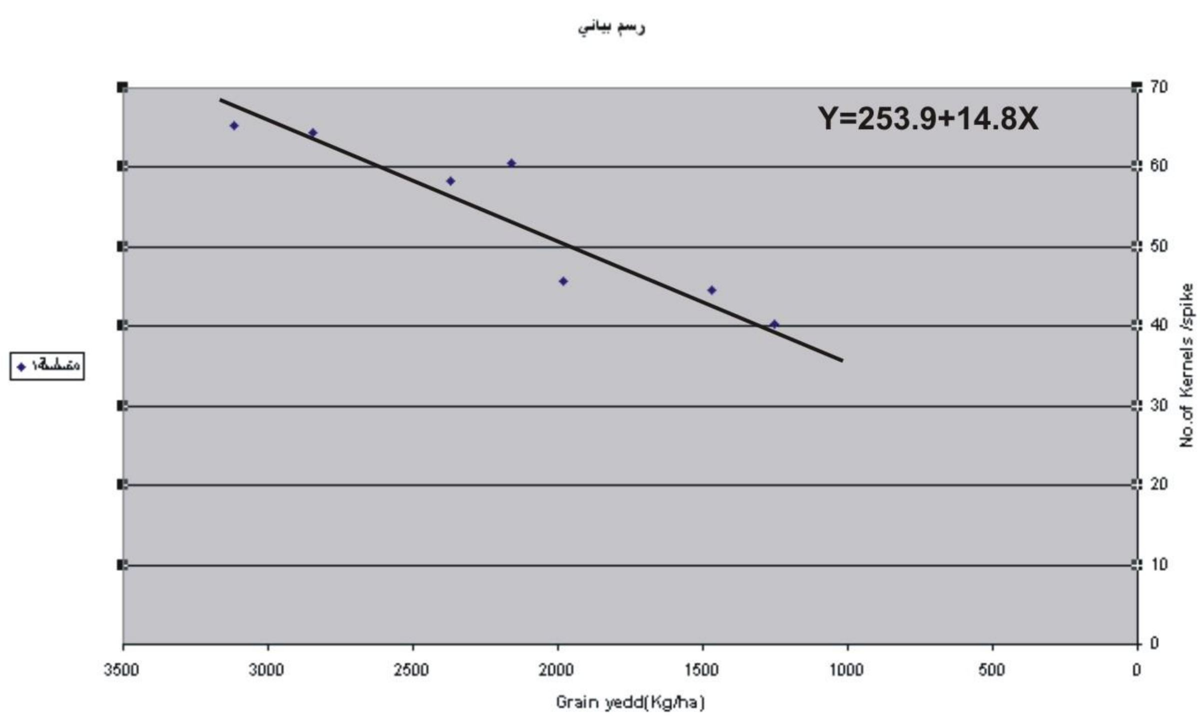

Fig.1: stepwise regression between grain yield and No. of grain /spike.

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دراسة الارتباطات بين الحاصل ومكوناته لبعض التراكيب الوراثية لحنطة الخبز *Triticum aestivum* L.

لبيد شريف محمد

جامعة تكريت ، كلية الزراعة ، قسم المحاصيل الحقلية ، صلاح الدين ، جمهورية العراق

المستخلص:

اجري هذا البحث بهدف دراسة الارتباط بين الحاصل ومكوناته لتحديد الصفة التي يمكن ان تتخذ كدليل لانتخاب تركيب وراثي germplasm متفوق في الحاصل.استخدمت في البحث اربعة اصناف من الحنطة الناعمة مع ثلاث طفرات مستحدثة من الصنف المحلي عجيبة في حقول التويثة في بغداد خلال الموسم 2001-2002. تم حساب قيم الارتباط البسيط والجزئي والمتعدد بالاضافة الى استخدام الانحدار المتعدد بطريقة الـ stepwise regression procedure لتحديد الصفة الاكثر تاثيرا في الحاصل. اظهرت نتائج الارتباط البسيط وجود ارتباط

معنوي موجب بين الحاصل وعدد الحبوب بالسنبلة، بينما كان الارتباط بين الحاصل وارتفاع النبات ارتباطا معنويا سالبا. اما قيم الارتباط الجزئي والمتعدد فقد اظهرت بان ارتباط الحاصل مع صفة عدد الحبوب اقوى من ارتباطه مع الصفات الاخرى. كذلك اظهر تحليل الانحدار المتعدد بان عدد الحبوب في السنبلة اكثر تاثيرا في الحاصل من الصفات الاخرى مما يستدعي الاهتمام بهذه الصفة عند الانتخاب للحاصل العالي.