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STABILITY PREFORMANCE OF SOME INTRODUSED GENOTYPE OF BREAD WHEAT *(Triticum aestivum L.)*

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ABSTRACT

This study was carried out to assess the stability and some genetic parameters of twelve diverse genotypes of bread wheat including Local variety rezgary as check. The genotypes were sown in three season, 2015-2016, 2016-2017 and 2017-2018. combained analysis of variance revealeted highly significant mean square of seasons for all the studied characters including different response of the genotype ATTILASOY exhibited stable performance across seasons for grain yield and 1000-grain weight followed by genotype FIAG-3, while other genotypes was diverse for characters stability. Also the results showed that, the phenotypic variance was highter than genotypic one all studied characters.

The higher value of vrariance was observed in plant height (44.84) and 1000-grain weight (27.54). However the genotypic coefficient of variation (GCV) was low for all characters, while the modrate PCV was showen for grain yield and 1000-grain weight with values 18.67 and 13.87 respectively, indicating that the characters more affected by the environmental factors. Broad sences heritability was the modrate for plant height (0.59) and days to flowering (0.60) and low for the other character. The expected genetic advance values (GA) were low for all characters and ranged between 1.2 for hectoliter to 8.06 for plant height. So that suggested these characters improve by putting the genotype in hybridization programse.

KEY WORD: Bread wheat, genotyps, grain yield, stability, genetic parameters.

INTRODUCTION

Bread wheat (*Triticum aestivum* L.) is the main cereal crops in world and Kurdistan Region/Iraq. Information about stability is useful for the selection of crop genotypes as well as for breeding programs because yield performance of any genotype is a result of interaction between genotypes and environment. The reliability of genotypes performance across years can be important consideration in plant breeding. Some genotypes are adapted to broad range of environmental conditions and others are limited in their potential distribution.

The interaction between genotypes and environmental condition help in determining the stability of new genotyps and could used as are important criteria to be considered to determine the variation between genotypes given in the field unit for several years and under different agriculture parameters. It is important to evaluate the stability of genotypes and its performance in wide range of different environments. (Trethowan *et al*.,2012). For this purpose the multi-location trials over a number of years are conducted, sometime in any location by planting at different locatsowing data or, using various spacing and doses of fertilizers and irrigation levels (Luthra et al .,1974 and Tehlam 1973). According to Rajaram *etal*. 1996, the selection of superior genotypes in a plant breeding program is based mainly of their yield potential and stablility performance over range of environments, also Crossa *etal*.,1988 reported that the choice of an adequate mode to measure the stability of different genotypes is a question to be resolved by researchers.

Many methods were useed for evaluation and selecting stable genotypes in a crop improvement program have been developed by many workers such as: regression coefficient of Finlay and Wil. Kinson 1962; Eberhart Russel.,1966 Perkins and Jinks,1968, Free man and Perkins,1971, variance across environments (EV) (Lin *et al*.,1986); Homeostatis (H%) (El-Sahookic,1985), genotypic resultant (GR), (E-Shookic,1990). The aim of this study is to

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determine high-yielding and stable wheat genotypes of with the trials conducted in three years in same location.

MATERIALS AND METHODS

Twelve bread wheat genotypes (*Triticum aestivum* L.) (Table 1) were grow under rainfall conditions in Kurdistan Regions in Iraq during 2015-2016, 2016-2017 and 2017-2018 at Dohuk Agricultural research center with sowing date(5/11, 7/11 and 4/11for the seasons respectively) Table 2 shows the quantities of rain falings during the three seasons. All experiment across the three year were arranged in according of randomize complete block design with three replications. The experimental unit consisted of four rows of four m length and 0.2 cm row space seeding rate 100kg/ha. Al trail plots in the three seasons(used at three different enviroments E2and E3 respectevility) were fertilizer with Dap fertilizer (46% P_2O_5 and 18% N) and 80 kg. Urea (46% N) were applied at the beginning of stem elongation stage. The data was analyzed recorded for plant height, hectoliter weight (Hw), 1000-grain weight, days to maturity, days to flowering and grain weight. The data was analysis according to randomize complete block design also the combined analysis of variance on all studied traitsaccros the three environments was done according to the method given by Comstock and Moll (1963). Two stability parameters(regression coifficie and deviation from regression) were applied according to Russell and Eberhart Method (1966)to assess stability performance of the 12 genotypes and to identify superior genotypes.

Table (1): Inbred lines using in the study

	Inbred lines	source
1	Rizgary	Local variety
2	SHUHA-4//NS732/HER/3/MILAN/DUCULA	ICARDA
3	ATTILA50Y//ATTILA/BCN/3/PFAU/MILAN	ICARDA
4	SERI.1B*2/3/KAUZ*2/MNV//KAUZ/4/PRINA/WEAVER//STAR	ICARDA
5	JAWAHIR-1/GIRWILL-5	ICARDA
6	SERI.1B//KAUZ/HEVO/3/AMAD/4/FLAG-2	ICARDA
7	KBG-01/FLAG-7	ICARDA
8	FLAG-3/ICARDA-SRRL-5	ICARDA
9	KAUZ/PASTOR/3/ALTAR 84/AEGILOPS SQUARROSA(TAUS)//OPATA	ICARDA
10	HUBARA-3*2/SHUHA-4	ICARDA
11	Adana 99	ICARDA
12	Arehane	ICARDA

Table (2): Rainfall (mm) in 2015,2016,2017,2018.

Months	Years			
	2015	2016	2017	2018
January	79.4	144	58.3	76
February	62.6	65.7	20.4	121.5
March	71.4	104.1	102.9	19.3

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April	40.2	58.6	70.1	121.9
May	9.6	3.8	33.4	120.6
June	0.0	1.6	0.0	1.1
September	12.2	0.0	0.0	0.0
October	38.2	8..8	4.7	66.
November	80.1	22.6	33.7	181.1
December	107.1	101.9	21.9	245

RESULTS AND DISCUSSION

Combined analysis of variance over three environments revaluated highly difference for some characters of bread wheat genotypes (Table.3) For genotypes effect, the results indicated significant effect for plant height, days to flowering and maturity and 1000 grain weight, with exception hectoliter and grain yield. For E+(V+E) the results showed highly significant effect and also, the environment linear was highly significant effect on all studied characters, while the VxE (linear) exhibited highly significant effect on all studied characters except 1000-grain weight and grain yield, indicating high variability in genotypes at different environments reflecting the differential response of genotypes in various environments. This result exhibited also that genotypes showed both additive and variation cross over type of inviroment of interaction. These results were in accordance with finding of Baktash and Hassan,2015; Jhinjer *et al.*,2017; siddhi *et al.*, 2017 and Grmaa *etal* ;2018.

Table (3): Analysis of variance for yield and some characters of 12 bread wheat genotypes over three environments.

SOV	df	MS					
		Plant height(cm)	Days to flowering	Days to maturity	Hectoliter weight	1000 grain weight(g)	Grain yield
V	11	82.20**	23.38*	13.14*	4.79	23.41*	0.63
E+ (V+E)	24	179.67**	809.09**	653.79**	17.94*	61.30**	0.81**
E – linear	1	4032.65**	19323.4**	15572.3**	328.28**	1349.92**	17.53**
VxE(linear)	11	16.64**	5.97**	7.29**	3.19**	2.50	0.07
Pooled deviation	12	8.04	2.42	3.20	5.60	7.82	0.09
Pooled error	72	2.70	0.35	0.24	0.38	6.06	0.027

*and ** significant at 0.05 and 0.01 level probability, respectively.

It was shwen from Tblbe 4 that the highest value of plant height was found at environment 2 followed by E3 and then by E1. However environment 1 and 3 gave the lowest value (87.47 and 93.30) respectively. Differences among genotypes across environment for the

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same characters, showed a superiority by genotypes1 (105.3cm) followed by genotypes 3 and 11 with values 96.33 and 93.0cm respectively. However the genotype 10 gave the lowest value (81.66) of the mentioned character.

The regression coefficient (bi) for all genotypes exhibited no significant difference from unity, the genotypes 1,2,3,4, and 11 gave mean values above the grand mean. Also the results in the same table indicated that the genotypes 1,2,5,7 had significant deviation from regression (s^2di), indicating that genotypes would be classified as unstable, also these results showed that the other genotypes were stable because they had s^2di values which were not significantly different from zero and bi=1. Garmaa *etal*.2018 and Siddhi *et al*.,2017 reported that plant height is the most stable character compare with other characters in crops.

Table (4): stability characterization for plant height of 12 bread wheat genotypes.

Env.	1	2	3	4	5	6	7	8	9	10	11	12	Mean
E1	100	84	92	88	86	87	86	85	87	78	87	89	87.47 c
E2	106	98	99	97	97	97	94	94	96	84	100	97	96.50 a
E3	110	88	98	94	87	91	96	89	94	83	98	92	93.30 b
Mean	105.3 a	90.0 f	96.33 b	93.0 cde	90.0 f	91.66 c d	92.0 E d f	89.33 f	92.33 e d f	81.66 g	95.0 c d e	92.66 e d f	
GM							92.42						
Bi	1.02	1.26	.091	0.95	0.82	0.92	1.11	0.92	1.01	0.79	1.52	0.69	
S^2di	20.34**	9.75*	-2.87	-4.13	23.05**	0.37	9.89*	-2.75	-2.91	-3.82	0.11	-1.27	
SEb	0.155												

*and ** significant at 0.05 and 0.01 level probability respectively.

For days to flowering as presented in Table 5, the means of the environments ranged from 100 days for E1 environment to 126 days for E2. As for the genotypes, the earliest genotype was record by genotype one with value 102.26 days, whiles the latest genotypes was 4, 5,7,11 which recorded 112 days. Also the genotypes 2, 4,5,6,7,9,11 gave mean values above the grand mean (110 days). It was shown from the same table the valuse of stability regression coefficient bi and deviation from regression for the days to flowering, all genotypes recorded regreesion coefficient no significant difference from unity, For s^2di values the genotypes 1,4,5,7,10,11 and 12 had significant deviation from regression, indicating these genotype considerable un stable for the environment, whiles the another genotypes gave non- significant values for s^2di, therefore it could be proceed in the stability analysis Eberhart and Russell, 1966. These result indicated that the relative ranks of the genotypes differed from one environment to another. Similar results were finding by Al-otayk, 2010 and Parveen *et al*., 2010.

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Table (5): stability characterization for day to flowering for 12 bread wheat genotypes.

Env.	1	2	3	4	5	6	7	8	9	10	11	12	Mean
E1	94	101	96	102	103	100	102	100	101	99	102	97	100 c
E2	115	128	121	130	128	128	127	128	128	128	128	123	126 A
E3	99	104	101	104	105	105	107	104	104	102	108	102	104 b
Mean	102.26 C	111.0 Ab	106 d	112 a	112 a	111 ab	112 A	110.66 bc	111 b	109.66 cd	112.66 a	107.33 de	
GM							110						
Bi	0.87	1.02	0.94	1.01	0.91	1.06	0.98	1.08	1.01	1.05	1.01	1.01	
S^2di	** 2.70	-1.02	-0.64	** 6.97	* 0.73	-0.91	* 0.83	-1.23	-0.70	** 2.55	** 1.77	* 0.82	
SEB	0.039												

*and** significant at 0.05 and 0.01 level probability respectively.

The stability characterization for days to maturity of twelve bread wheat genotypes was presented in Table 6. The results recorded that the average of the environments ranged from 141 days for environment three to 169 days to environment 2. For mean of genotypes over the three environments the earliest genotypes were recorded by genotype one and three with values 146.66 and 148.66 days, respectively while the latest genotype was recorded by genotype 4(156.33 days). For the stability regression coefficient (bi),revelated that the all genotypes recorded value close to unity. Concerning with s^2di values the genotypes 1,2,3,4,8,9,11 and 12 had a significant deviation from regression, indicating that these genotypes would be classified as unstable , more ever the other genotype had low value for days to maturity, a regression coefficient near to the unity and small deviation from regression considering it stable. Similar finding by Mudhu *et al*., 2018; Siddhi *et al*., 2017 and Polat *et al*.,2016.

Table (6): stability characterization for days to maturity of 12 bread wheat genotypes.

Env.	1	2	3	4	5	6	7	8	9	10	11	12	Mean
E1	140	143	141	148	146	144	144	148	144	144	146	144	146
E2	164	171	165	179	173	172	169	148	173	174	173	169	169 a
E3	136	138	140	142	142	141	142	148	140	138	143	143	141 c
Mean	146.66 E	150.66 cd	148.66 de	156.33 a	153.66 b	152.33 bc	151.66 bc	148 cd	152.33 bc	152.0 bc	154.0 b	152.0 bc	
GM							152						
Bi	0.88	1.01	0.93	1.13	0.97	1.02	0.93	1.03	1.05	1.09	0.98	0.95	
S^2di	** 1.73	** 2.40	** 6.96	** 0.84	-0.13	-1.74	0.20	** -1.41	** -0.91	0.61	** -1.03	** 9.38	
SEb	0.049												

**significant at 0.01 level probability.

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The highest means for hectoliter weight was recorded by environment one (83.59), followed by environment two (81.04) and environment three gave the lowest value (78.31) (Table 7). Differences among genotypes across environment for this caracter showed the results exhibited a superiority by genotypes 6 (82.32) followed by genotypes 11 and then genotype 8. The results in the same table showed that the stability parameter(bi) were not significant for all genotypes hectoliter weight, the genotypes 1,2,6,8 and 11 gave mean values above the grand mean. Also the genotypes recorded significant value for s^2di were 1, 2,5,6,7, and then 12, revealing that these genotypes was unstable than the others under the three environment studied for this caracter. Similar results were indicated by several workers like Gamaa *et al*., 2018,Siddhi *et al*.,2017 and Al0otayk,2010.

Table (7): stability characterization for hectoliter weight (kg/100 Lt) of 12 bread wheat genotypes.

Env.	1	2	3	4	5	6	7	8	9	10	11	12	Mean
E1	84.4	84.4	84.3	84.2	79.0	82.6	83.6	84.0	84.9	83.9	83.9	83.9	83.59 a
E2	83.80	80.43	82.47	80.23	75.33	85.03	83.90	81.90	78.80	79.80	83.40	77.33	81.04 b
E3	75.37	76.67	76.37	72.90	77.67	79.33	73.97	77.90	75.83	76.07	77.43	75.77	78.31 c
Mean	81.19 Bc	80.5 ed	81.04 bc	79.11 e	77.33 e	82.32 A	80.49 c	81.26 abc	79.84 de	79.92 cd	81.74 ab	79.00 e	
GM							80.99						
Bi	1.30	0.37	1.06	1.51	0.70	0.57	1.45	0.86	1.01	1.15	0.92	1.05	
S^2di	2.77**	1.80**	-0.58	-1.52	25.45**	6.08**	6.38**	-1.5	1.14	0.95	-0.52	8.16**	
S E b	0.452												

*and** significant at 0.05 and 0.01 level probability respectively.

Stability characterization for 1000-grain weight for twelve bread wheat genotypes over three environments presented in Table 8.The environment two had the highest significant mean value for 1000-grain weight (44.23g) than the other environments, also the environment one gave second order for this trait (38.32g). Regarding to 1000-grain weight, the highest values of this trait were recorded by genotypes 1, 3, and 12, while, the genotypes 2 and 9 gave the lowest values for this trait, with values 33.29 and 33.54g respectively. Regression coefficients (bi) for all genotypes in significantly differ from unity and close to unit. The genotypes 1, 3, 4, 7, and 12 recorded mean values above the grand mean. With remain to the second stability parameter(s^2di), all wheat genotypes had insignificant deviation from regression except genotypes 7 and 8, indicating that genotypes would be classified as stable. The researcher; Madhu *Et al*.,2018; Polat *Et al*.,2016 and Ismail and Mohammed 2014.

Table (8): stability characterization for 1000-grain weight od 12 bread wheat genotypes.

Env.	1	2	3	4	5	6	7	8	9	10	11	12	Mean
E1	43.83	35.08	42.34	39.28	37.38	37.04	39.03	36.54	34.95	36.78	36.86	40.76	38.32 b
E2	51.09	39.97	49.08	44.29	43.08	46.37	47.28	39.72	38.59	41.28	41.52	48.43	44.23 a
E3	33.80	24.83	33.93	31.57	29.43	28.27	32.63	26.60	27.10	29.17	30.53	30.73	29.88 c

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Mean	42.90 A	33.29 de	41.78 ab	38.38 bcd	36.63 Cd	37.22 cd	39.64 bcd	34.28 ed	33.54 e	35.74 cde	36.30 cde	39.97 ab	37.47
GM							37.47						
Bi	1.19	1.14	1.02	0.90	0.94	1.13	0.87	1.06	0.87	0.87	0.75	1.20	
S^2di	-1.72	7.93	-0.42	1.55	-1.80	17.48	25.26*	25.23*	4.67	-0.55	-1.75	-1.03	
S E b	0.26												

*,significant at 0.05 level probability.

Table9. Showed the stability characterization for grain yield. The environment two recorded the maximum grain yield plot (3.05), follow by the environment one (2.14) and the lowest value recorded by environment three (1.48). Differences among genotypes across environments, as for this caracter, the genotype 8 gave the highest value(2.43) and did not differ significantly from genotypes 4,5,7,10 and 11, on the other hand, the genotypes 1 had the lowest value (1.86) compared with the other genotypes under study. The same table shows that stability parameter (bi)which was not significant differed from the unity for the all genotypes and close to unity. With the second stability parameter (s^2di), all bread wheat genotypes had insignificant deviation from regression except genotype 4 and 10, indicating that these genotypes were stable for the three environment under study. Padma *et al*., 2019; Siddhi *et al*.,2018;Krupal *Et al*.,2018 has similar findings which are in agreement with this study.

Table (9): stability characterization for grain yield of 12 bread wheat genotypes.

Env.	1	2	3	4	5	6	7	8	9	10	11	12	Mean
E1	1.80	2.14	2.24	2.15	2.19	1.99	2.17	2.29	2.01	2.22	2.28	2.01	2.12 a
E2	2.27	3.66	2.99	3.15	3.29	3.19	2.88	3.36	2.86	3.15	3.27	2.64	3.05 a
E3	1.57	1.03	1.81	1.45	1.26	1.09	1.86	1.64	1.21	1.63	1.57	1.62	1.48 c
Mean	1.86 B	2.27 ab	2.34 a	2.25 a	2.35 A	2.09 ab	2.30 a	2.43 A	2.04 ab	2.33 a	2.37 a	2.09 ab	
GM							2.21						
Bi	0.48	1.59	0.75	0.75	1.17	1.25	0.69	1.08	0.96	1.27	1.03	0.64	
S^2di	-0.02	-0.01	-0.02	0.71**	0.03	-0.01	0.02	-0.03	0.04	0.12**	-0.02	-0.02	
S E b	0.25												

**, significant at 0.01 level probability.

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Variance componentsans some genetic pqrqmeters for sex characters where present in Table10. The result shwed that the phenotypic variation was more than the genotypic one for all studied characters, the high value of phenotypic variance variation correspondence was observed in plant height 44.84 and 1000-grain weight (27.54). Phenotypic coefficient of variation (PVC) showed wide range for all studied characters, which ranged from 2.21 for days to maturity to 18.67 for grain yield/plot. However the genotypic coefficient of variation (GCV) was low for all characters and ranged 1.43 for days to maturity (1.43) to 7.69 for 1000-grain weight. From the results in the same table, modrate (PCV) were reported for grain yield/plot and 1000-grain weight with value 18.67 and 13.87 respectively. For heritability in broad sense the modrate values were recorded for plant height (0.59) and days to flowering (0.60) and low value for the rest characters and ranged 0.20 to 0.42 for hectoliter and days to maturity. These results indicated that the environment had high influence on the expression of these characters. Which suggested that these genotypes putting in hybridization program to improve the yield of the study materials. The estimates of genetic advance help in understanding the type of gene action involved in the expression of various polygenic characters. The expected genetic advance values (GA) and the values as percentage of genotype means (GAM). The results exhibited low values for all characters and between 1.20 for hectoliter weight to 8.06 for plant height. Whereas, the low heritability and genetic advance values, indicating, that non-additive gene action and the selection was in effective to improve these characters. A similar results was obtained by Padma *etal.,*2019;Krupal *etal.,*2018; Madhu *etal.,*2018 and Abdel Aziz *etal.,*2017. We can be the promising genotypes were putting in differint location and realized the best of them.

Table (10): Genetic parameter for yield and some characters of 12 bread wheat genotypes

Genetic parameters	Plant height cm	Days to flowering	Days to maturity	Hectoliter weight	1000-grain weigh(g)	Grain yield
Vg	28.82	7.71	4.29	1.43	8.50	0.01
Vge	10.66	3.96	5.24	4.14	0.25	0.06
Ve	7.35	1.03	0.67	1.26	18.77	0.07
Vp	44.84	12.70	10.21	6.85	27.54	0.15
Heritability	0.59	0.60	0.42	0.20	0.30	0.08
GA	7.05	3.80	2.36	0.96	2.85	0.05
GAY	8.06	3.81	1.64	1.20	7.52	2.66
Gcv	5.92	2.78	1.43	1.49	7.69	5.31
Pcv	7.65	3.57	2.21	3.25	13.83	18.67

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اداء الاستقرارية لبعض التراكيب الوراثية المتداخلة من حنطة الخبز
(Triticum aestivum L.).

الخلاصة

اجريت دراسة لتقيم الاستقرارية و بعض المعالم الوراثية لعدد من التراكيب الوراثية من الحنطة الناعمة في ثلاثة مواسم شتوية و باستعمال اثنا عشر تركيبا مختلفا وراثيا بضمنها صنف محلي رزكارى كصنف للمقارنة. زرعت المواد الوراثية في الموسم الشتوي للعوام 2015-2016 و 2016-2017 و 2017-2018. اظهر التحليل المشترك وجود ضروفات للمواسم الزراعية على جميع صفات المدروسة و الذي عكس اختلاف استجابة هذه التراكيب للمواسم.

اظهر التركيب الوراثي (ATTILASOY) استقرارية وراثية عالمية لحاصل البذور وزن 1000 بذرة تتبعه التركيب الوراثي . اظهرت النتائج ان التباين المظهري اعلى من التباين الوراثي جميع الصفات و كان اعلى ظهرت النتائج ان التباين المظهري اعلى من التباين الوراثي جميع الصفات و كان اعلى تباين لارتفاع النبات بلغ 44.84 و يلية وزن 1000-بذرة (27.54) كما اظهر معامل الارتباط الوراثي (FIAG-3) قيم واطئة جميع الصفات بينما كانت قيم الارتباط المظهري عالية لحاصل الحبوب و وزن 1000 بذرة بلغت 18.67 و 13.87 مما يدلل ان هذه الصفات اكثر تأثير بالعوامل البيئية. أما نسبة التوريث بالمعنى الواسع فكانت القيم متوسطة لارتفاع النبات 0.59 و عدد الايام الى التزهير 0.60 واطئة لبقية الصفات. أظهر التحصيل الوراثي قيم واطئة لجميع الصفات المدروسة تراوح بين 1.2 للوزن الحجمي و 8.06 لارتفاع النبات.

ان انخفاض قيم التوريث بالمعنى الواسع و التحصيل الوراثي يدل على أن هذه الصفات لا تخضع للتأثيرات الجينات الاضافية و ان عملية الانتخاب غير فعالة للتحسين هذه الصفات و عليه تقترح ان توسع هذه السلالات من الحنطة الناعمة في برنامج للتهجين لغرض تحسين الحاصل و مكوناته لهذه التركيب.

كلمات مفتاحية : حنطة الخبز,تراكيب وراثية ,حاصل الحبوب, الاستقرارية،المعالم الوراثية

تێبینی:

ئێك ژ هەلسەنگینەرا داخازا خشتێ بارانێن دەڤەرێن جودا دكەت ژ بەر كو ڤەكولین ل جهەكی بتنێ هاتیە ئەنجام دان مە بتنێ بارانێن وی جهێ دخشتەی دا ئینانە خلری ل فەكولینێ دا گەل رێز گرتنێ

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