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Research Article

GENOTYPIC AND PHENOTYPIC VARIATION AND HERITABILITY IN BULB COMPOSITION OF ONION (*Allium capa* L.)

Kamal Benyamin Esho Haneen Muner Hussen* and Kareem Abdullah H. Albaiaty

College of Agriculture and Foerstry /Mosul University.Iraq

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ABSTRACT

The experiment was carried out at station of agriculture research, College of agriculture, Kirkuk University, during the fall growing season (2017/ 2018). To study the genotypic and phenotypic variation in bulb composition of onion .the experiment included eight genotyoes of onion (Bevas sspy, Sinjary, Deralock, Bevas zour, Baashiqy, Kani Komani, Bayasy bevas and Kani Komani (2). The result showed that there was significant between all traits under study at 5% level of Duncan. which were the number of leaves /plant, biological yield , bulb length , diameter and weight, T.S.S.and total yield per plant. the genotype Bevas sspy gave highest number of leaves per plant, biological yield, bulb diameter, bulb weight and un total yield (ton /hectare). the phenotypic were higher in number of leaves per plant, bulb length, T.S.S and total yield. Whoever, the GCV and PCV were higher in number of leaves per plant, bulb length, and total yield. The broad sense heritability was more than 30 % for the number of leaves per plant biological yield and in total yield, the genetic advance take the same result for the traits under the studied.

INTRODUCTION

Onion (*Allium cepa* L.) is a monocot belonging to the family Alliaceae of the clss liliopsida , according to a classification by Takhtajan (Fritisch and Friesen ,2002). Is a photoperiod sensitive crop with short day (15-16h) and long day more then 17 h .So onion crop needs more attention towards evaluation of varieties in a particular region where these genotypes are supposed to be cultivated . It is one of the important major spice crops in Iraq , it is cultivated throughout the land of Iraq during winter growing season . Onion is used not only as dried bulbs but also as a fresh yield .Onion plant rich in Ca and carbohydrates , Fe , Thiamin , vitamine A , Riboflavin and ascorbic acid . Onion is a bienial herbaceous plant and consider as cool season crops (Hasan , 2011). It needs more attention towards evaluation of varieties in a particular region where these cultivars are supposed to be cultivated **.** Onion varieties vary widely in composition , from those with firm bulbs of high dry matter content to those with soft bulbs of low dry matter content Successful onion production depends on the selection of varieties that are adapted to different climatic conditions imposed by specific environment (Pandey , 1989). Bindu and Bindu (2016) revealed thegenotypes of onion differed in plant height , number of leaves , weight and diameter of bulb and in total yield . In order to determine the genetic variability of onions grown in Iraq for the aim of breeding .Jelica *et al*., (2013) indicated there was high variability values have been established for bulb skin color , bulb fresh color . these two traits had the largest impact on clustering with a single genotype being heterogeneous exactly for these two traits . The studies related to genetic variability , heritability and inter relationship between yield and yield component traits may be helpful to exercise an efficient selection programe.There was higher value in GA and heritability for bulb weight and total bulb yield (Haydar *et al*., 2007 ; Dhotre *et al*., 2013) . Many researchers indicated the positively correlation between total yield of bulb with plant height weight of bulb , T.S.S and length ,diameter bulb (Hosamani *et al*., 2010 ; Asohk *et al*. 2013) . High estimates of PCV were recorded in bulb yield , and bulb weight , while ,GCV were in total bulb yield , high heritability couple with high genetic advance as per cent of mean were observed for total yild and bulb weight , correlation coefficient analysis revealed that total bulb yield had positive significant correlation with number of leaves per plant , plant height , diameter of bulb , weight of bulb (Dewangan and Sahu 2014 ; Lakshmi 2015 and Akanksha *et al*., 2015) . Chatto *et al*., (2015) showed that total yield and average bulb weight exhibited high heritability with high genetic advance , total bulb yield was found to be positively correlated with average bulb weight , equatorial diameter , plant height and total soluble solids .

Corresponding author:* **Hiteshkumar Solanki
Department of Botany, School of Sciences, Gujarat University Ahmedabad

The present stud was undertaken to studies the Genotypic and phenotypic variation and heritability in bulb composition of onion (*Allium capa* L.) under the condition of Kirkuk, Iraq.

MATERIALS AND METHODS

The experiment was carried out at station of agriculture research, College of agriculture, Kirkuk University, during the fall growing season (2017/ 2018). To study the correlation and path coefficient analysis in some local genotypes of onion (Table 1)

No.	Name of genotypes	Location collected
1	Bevas sspy	Aqdush village /Sarsunk
2	Sinjary	Baathraa /Nineveh
3	Deralock	Deralock / Amadia /Dohuk
4	Bevas zour	Bear ssefee /Zakho
5	Kani Komani (1)	Komain / Dohuk
6	Baashiqy	Nawaran /Nineveh
7	Kani Komani (2)	Deralock / Amadia /Dohuk
8	Bayasy bevas	Badresh /Ashaer sabaa/ Agreh

The bulbest of eight genotypes were sowing at 25/10/2017, the plant spacing between bulbest was 10 (cm.) and among the rows was 70 (cm.). It's planting at two sides from the rows, the unite area for each plot is (2 X 1.5 m.) with tow rows per plot. Thus factorial experiment included 8 treatment (genotypes) arranged in the field in Randomized Complete Blocks Design (R.C.B.D) three replicate. The data was recorded for the traits ; leaf length (cm.), number of leaves per plant, biological yield per plant (g.), bulb length and diameter (cm.) bulb weight, total soluble solid (T.S.S) and total yield (ton per plant). The data were analyzed statistically design (Steel and Torrie, 1980) , by using SAS (1996). The phenotype and genotype were estimated as suggested by Comostock and Robinson (1952). The phenotypic and genotypic correlation coefficient was according to Walter (1975). Heritability in broad sense and expected genetic advance as percent of mean were estimated as suggested by Johnson *et al*. (1955) and Uguru (2005). The analysis of PCV GCV according to Allard (1960) .

Table 2 Variation analysis (ANOVA) for the genotypes onion

S.O.V	df	Mean Square							
		Length of leaf(cm.)	Number of leaves /plant	Biological yield (kg.)	Bulb length (cm.)	Bulb diameter(cm.)	Bulb weight (g.)	T.S.S	Total yield (ton/hectar)
Blocks	2	672.898	161.o3	0.289	10.965	4.303	0.014	15.267	918.893
Genotypes	7	14.742	23.195*	0.002*	1.641*	0.693*	0.002*	3.471	120.535*
Error	14	139.45	121.693	0.010	16.841	5.994	0.011	41.129	561.752
Total	23	827.090	305.918	0.301	29.447	10.990	0.027	59.867	1601.180

Table 3 The mean value of the traits in onion genotypes

Genotypes	Length of leaf(cm.)	Number of leaves /plant	Biological yield (kg.)	Bulb length (cm.)	Bulb diameter(cm.)	Bulb weight (g.)	T.S.S	Total yield (ton/hectar)
1	77.80 a	25.36 a	0.24 a	8.11 ab	7.11 a	0.19 a	12.05 a	45.35 a
2	70.20 a	17.43 b	0.20 abc	7.09 ab	6.03 ab	0.14 ab	11.90 a	34.93 abc
3	76.86 a	20.73 ab	0.20 abc	8.20 ab	6.29 ab	0.13 ab	1147 a	32.45 bc
4	77.86 a	21.70 ab	0.18 bc	8.55 ab	5.65 b	0.12 ab	11.63 a	27.37 c
5	75.63 a	18.30 b	0.23 ab	7.52 ab	6.33 ab	0.16 ab	11.62 a	38.51 abc
6	80.66 a	20.60 ab	0.23 ab	8.93 ab	6.53 ab	0.17 ab	11.68 a	42.08 ab
7	77.13 a	16.83 b	0.17 c	7.45 b	6.42 ab	0.12 b	13.08 a	28.94 c
8	76.40.a	18.56 b	0.23 ab	9.65 a	5.67 b	0.13 b	12.25 a	31.74 bc

Table 4 The genetic parameters of the traits onion genotypes

Parameters	Length of leaf(cm.)	Number of leaves /plant	Biological yield (kg.)	Bulb length (cm.)	Bulb diameter(cm.)	Bulb weight (g.)	T.S.S	Total yield (ton/hectar)
Range	80.67 – 75.63	25.37-16.83	0.237-0.130	8.933-7.453	7.117-5.65	0.185-0.117	13.083-10.633	45.347-27.373
Mean -SE	77.7	19.94	0.211	8.292	6.247	0.145	11.835	35.172
$Б^2$ P	11.55	13.52	0.001	1.349	0.516	0.001	3.115	66.92
$Б^2$G	1.593	4.83	0.003	0.146	0.08	0.003	0.178	26.8
PCV	14.86	69.72	0.49	16.26	8.26	0.75	26.232	190.28
GCV	2.05	24.24	1.75	1.76	1.4	2.27	1.5	76.2
H^2 (b. s.)	13.78	35.73	35.61	10.81	17.08	29.55	5.71	40.04
Genetic advance	96.54	270.77	1060.95	25.87	25.28	1.92	20.77	674.92
Mean from GA	124.25	1357.95	1153.31	312.08	404.67	1327.58	175.53	1918.91

Table 5 Correlation between the pairs of traits in onion genotypes

The traits	r	Length of leaf(cm.)	Number of leaves /plant	Biological yield (kg.)	Bulb length (cm.)	Bulb diameter(cm.)	Bulb weight (g.)	T.S.S	Total yield (ton/hectar)
Length of leaf(cm.)	rp	1	0.032	0.198*	- 0.029	- 0.003	0.017	0.378**	0.042
	rg	1	0.346**	0.204*	0.355**	0.133	0.172	0.467**	0.193*
Number of leaves /plant	rp		1	0.311**	- 0.160	0.458**	0.407**	- 0.280*	0.441**
	rg			0.514**	1.117**	0.563**	0.912**	- 0.344**	0.605**
Biological yield (kg.)	rp			1	0.348**	0.274*	0.524**	0.147	0.525**
	rg				0.553**	0.618**	0.912**	0.00	0.953**
Bulb length (cm.)	rp				1	- 0.371**	- 0.012	0.014	- 0.108
	rg					- 0.026	- 0.065	0.231*	0.120
Bulb diameter(cm.)	rp					1	0.651**	0.041	0.599**
	rg						0.994**	0.077	0.974**
Bulb weight (g.)	rp						1	- 0.160	0.967**
	rg							- 0.32	0.923
T.S.S	rp							1	- 0.166
	rg								-.0.124

RESULTS AND DISCUSSIONS

The mean square of the morphological traits of eight varieties of onion are presented in Table (2). Results showed a significant ($p < 0.05$) variability between the varieties in most traits excepted in the length of leaf and in total soluble salt

(T.S.S). Many of research observed the significantly variability in onion genotype as Hossain *et al*., (2008); Ahmed *et al*. , (2013); Jelica *et al*., (2013); Esho and Al-Gumar (2015) ; Bindu and Bindu (2016); Priyanka *et al*. ,(2017)

Table (3). Showed the mean value of the traits in eight onion varieties , there were certain characters with great differ between onion varieties traits related to i.e. number of leaves per plant, biological yield , bulb length, bulb diameter, bulb weight, T.S.S and total yield, it was indicated that was not significantly in length of leaf between all eight varieties , while cv. Bayasy bevas gave a higher length in leaf (80. 66 cm), in the other hand the cv. Bevas sspy was superior in the number of leaves per plant (25.36), biological yield (0.24 kg), bulb diameter (7.11 cm.), bulb weight (0.19 g) and in total yield (45.35 tonper hectare compared with the other varieties , where over , the cv. Bayasy bevas superior in bulb length (9.05 cm.) comparative with the all varieties under the studies.

These results are similar to the finding of; Cheema *et al*., (2003); Hosamani *et al*., (2010); Boukary *et al*., (2012); Azzom *et al*., (2014); Galindez *et al*., (2016) .

Table (3) showed the range, genetic parameters in onion varieties, the highest estimate of phenotypic variance ($Б^2p$) was observed for total yield per unit area (66.92), number of leaves per plant (13.52) and length of leaf (11.55). magnitude of genotypic variance ($Б^2g$) take the same side like the phenotypic for the traits in onion varieties. The environmental variance of the above the characters was indicated to be very low indicating which had very little effect on the phenotypic variations of the traits. In other hands the phenotypic coefficient variation was highest total yield (190.28) , number of leaves per plant (69.72), T.S.S (26.232) , bulb length (16.26) and in length of leaf (14.86), while the genotypic coefficient variation was highest in total yield (76.2), number of leaves per plant and bulb weight (2.27), a comparatively low GCV indicated for length of leaf, biological yield, T.S.S and bulb diameter, is indicative of less scope for improvement.

It showed that the heritability in broad sense value was recoded more than 25 % for the number of leaves per plant, biological yield, bulb weight and total yield. The high heritability estimates obtained in some of traits are indications that program selection could be effective for improving in this traits, these traits could be controlled by additive genetic effect and can be used for improvement through phenotypic selection. The value of genetic advance was higher in most traits under the studied for the onion varieties excepted for the bulb weight and T.S.S. The high phenotypic, genotypic variation and heritability in broad sense for these traits in onion was reported by some of researches Yaso (2007); Haydar *et al*., (2007); (Rashid (2008); Marey and Morsy (2010); Hosamani *et al*., (2010); Iqbal *et al*., (2012); Dhotre *et al*., (2013) .

Table (4) showed the correlation coefficient between the pairs of traits in onion varieties. In most of the case phenotypic correlation coefficient is higher. length of leaf showed significant and negative correlation with biological yield , and T.S.S. Number of leaves per plant was significant negative correlation with biological yield, bulb diameter , bulb weight and with total yield, and significant positive with T.S.S. Biological yield showed significant negative with all traits. Bulb diameter showed significant negative with bulb weight and total yield. Bulb weight was significant negative correlation with total yield.

Also form table (4) there was a significant negative genotypic correlation between the length of leaf among number of leaves per plant, biological yield, bulb length and T.S.S. Number of leaves was significant negative genotypic correlation with all traits and positive with T.S.S. Biological yield indicated significant negative genotypic correlation with all traits under the study. Bulb diameter showed significant negative genotypic correlation with bulb weight and total yield. It is similar result according to Esho and Gumar (2015); Dewangan and Sahu 2014 ; Lakshmi 2015 and Akanksha *et al*., (2015) . Chatto *et al*., (2015).

CONCLUSION

From the study investigation that onion varieties Bevas sspy responded well for most traits studied . Although genetic parameter was high value in total yield number of leaves per plant, the heritability was more than 25% for some traits . Total yield showed significant negative phenotypic and genotypic correlation coefficient with all traits.

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