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AGRONOMICAL AND BIOCHEMICAL EVALUATION FOR SOME EXOTIC BARLEY GENOTYPES

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Abstract

A field experiments including 63 exotic barley genotypes were conducted at three locations (Nubaria , Giza and Fayoum) in two growing seasons (1998-1999 and 1999-2000) . Each entry was planted in four rows per plot in randomized complete block design with three replications. Results showed that six genotypes were earlier and ten were the tallest than national check NC (Giza 125) by about 9 days and 8 cm, respectively. Genotypes No., 56, 54, 34, 7 and 6 had the heaviest kernel weights (47.9, 47.58, 47.0, 46.24 and 45.74 gm., respectively). Grain yield and barley disease the field results showed that 20 genotypes had high yielding potential and good reaction for Powdery Mildew (PM) and Leaf Rust (LR). According to the stability parameters eleven entries were more stable with good reaction of PM and LR. The chemical compositions revealed that protein content ranged from 12.33% in genotype No., 56 to 14.54% in genotype No., 15 while total carbohydrates ranged from 72.63% in genotype No., 35 to 78.28% in genotype No., 44. Polyacrylamide gel electrophoresis (PAGE) technique could be clearly differentiated between some genotypes. Although some groups of genotypes gave similar hordein and albumin-globulin mixture patterns. They could be discriminated by some differences by minor components.

INTRODUCTION

Barley is the world's fourth most important cereal crop in terms of cultivated area.It is used for human consumption and animal feeding. Barley production area in Egypt is located in North Coastal region and Newly reclaimed lands (El Bawab, 1999).Genetic variations may be obtained by collecting a large amount of exotic germplasm having a diversity of genetic traits. Exotic germplasm has not been used without testing and selection for its adaptability to a particular area (Mohamed *et al.*, 1997). The chemical composition of barley grains i.e., protein, fat and total carbohydrates were affected by varieties and particle size of ground barley (Rieckhoff *et al.*, 1999). Hordein composition in different barley cultivars was extremely heterogeneous (Autran and Scriban 1977), which allowed, species differentiation of genotypes by their electro-

phoretic analysis. Generally, barley cultivar hordiens can be divided into 7 groups by band pattern. El-Negoumy *et al.*, (1979) separated that albumin, globulin, hordein and glutelin fractions considering that hordium composition was not affected by environmental factors.

The objectives of this study were to evaluate some exotic barley germplasm under prevailing stress and to identify some promising genotypes characterized by seed yield and protein content.

MATERIALS AND METHODS

A total of 63 exotic barley germplasm including two national checks were used in this study. The exotic materials were received from the International Center for Agricultural Research in the Dry Areas (ICARDA). The origin of accessions studied is given in Table (1). Accessions were grown at three locations i.e., Nubaria, Giza and Fayoum, A.R.C., Egypt during 1998/1999 and 1999/2000 winter seasons in a randomized complete block design with three replications. Each plot consisted of 4 rows, 3m long and 20cm a part. Planting was done during December in both seasons. Fertilizers were applied at the rate of 30 Kg N and 15 Kg/fed P_2O_5/fed . The following traits were evaluated heading date, plant height, maturity data, 1000 kernel weight (1000 K.Wt /gm), spike length (cm), grain yield Ardab/fed. Leaf Rust (LR), Powdery Mildew (PM) reaction and chemical composition of seeds. Leaf Rust reaction was recorded as severity and response according to the modified Gobb scale (Peterson *et al.*, 1948) while, PM reaction was recorded on percent disease and 00-99 double – digit scale (Sarri and Prescott, 1975).

Regarding chemical composition twenty out of the 63 previous tested genotypes have high yielding potential and good reaction of LR and PM. The chemical analysis were as follows crude proteins, lipids, crude fibers, and ash were determined according to AOAC, (1990). Total carbohydrates were determined as described by Taylor, (1995). Soluble proteins (albumin and globulin) of barley grains were extracted with phosphate buffer 0.1 M, pH value 8.0 according to Giese *et al.*, (1983) being determined according to the method of Osborne, (1985). Hordein was extracted with phosphate buffer pH value 8.0 by 50% using isoproparal with 0.04 M mercaptoethanol ac-

cording to the method of Doll and Anderson, (1981) and the protein determined by the Osborne method, glutelin was roughly calculated by difference. Protein extracts of barley genotypes were identified with electrophoretic separation carried in SDS-PAGE 5 and 15% polyacrylamide in tris-glycine buffer pH value 8.3 according to Laemmli, (1970). Protein bands were stained with coomassie brilliant blue R-250 in mixture of 30g trichloroacetic acid, 200 ml methanol, 70 ml acetic acid and 800 ml H_2O.Destanining was carried out by using acetic acid, methanol and water,12:12:22,V/V according to Stegman *et al.*, (1984). After SDS-PAGE separation, the protein patterns were scanned at 600 nm.using Gelman DCD 16 Scanner Gelman Company. Data were subjected to statistical analysis of variance using least significant difference and combined analysis as reported by (Steel and Torrie, 1980). Stability analysis were estimated according to Eberhart and Russel, (1966).

RESULTS AND DISCUSSIONS

Plant performance :

The combined analysis of variance of the two seasons revealed significant differences between genotypes for all treatments indicating wide genetic variation among entries (Table 2). Number of days to heading and maturity varied between locations for the same genotypes as well as among genotypes within any given locations. The data in Table (2) show that six genotypes (No., 58, 59, 50, 46, 33 and 35) were earlier in heading than the other tested genotypes. These genotypes were earlier than the national check (NC) Giza 125 by 9 days on the average. On the other site, 16 genotypes were earlier in maturity date than the national check. For plant height mean of plant height across locations ranged from 75.6 cm at Fayoum to 117.2 cm at Giza. These results could be due to the variability in the soils at each location. Fayoum soil has high salinity but Giza has good clay soil (El Bawab, 1999). On the other hand, 30 genotypes at Giza, 4 at Nubaria, 9 at Fayoum and 10 on the combined were significantly taller than the NC (No., 62). Concerning 1000 kernel weight (1000 K.Wt) and spike length (SL) the results were only obtained from Giza location. The combined analysis over two seasons revealed that the mean of 1000 K.Wt ranged from 30.50 gm (genotype No., 16) to 47.90 gm (genotype No., 56). These differences between genotypes were due to the genetic make up. In this respect five genotypes (No., 56, 54, 34, 7 and 6) ex-

ceeded the NC (Giza 125) significantly. The highest length of spikes was (10.5 cm) came from genotypes No., 45 and 50 while the shortest length was 4.5 cm for genotype No., 15. On the other site 12 genotypes exceeded the NC significantly. Regarding grain yield, differences among locations and genotypes were significant indicating the presence of genetic variability among genotypes. The highest value of grain yield was obtained from Giza over two seasons (20.75 Ardab/fed) while the lowest value was (11.97 Ardab/fed) from Fayoum (over two seasons). On the other hand, six genotypes at Giza, four at Nubaria, nine at Fayoum and twenty on the combined out yielded the NC Giza 125 significantly. In this respect genotype, No. 38 came from the first order (20.34 Ardab/fed) with percent increase about of 20.78% compared to the NC (Giza 125).

Resistance to Powdery Mildew and Leaf Rust :

Screening for resistance to Powdery Mildew (PM) and Leaf Rust (LR) was carried out under natural field conditions only at Nubaria district (Table 2), where the natural epidemic was enough for selection for resistance for PM and LR. A total of 63 genotypes were evaluated whereas, 52 entries for PM showed resistant reaction. LR data demonstrate that six genotypes had 5-10 MR and 14 genotypes had 5-30 Ms. These 20 genotypes also showed resistant for PM. Generally from this study 20 entries had good reaction for PM and LR and can be used in barley breeding program. Regarding the grain yield and barley disease (PM and LR), the data elucidate that twenty genotypes had both high yielding potential and good PM and LR reaction.

Yield stability :

The means of grain yield over the six studied environments ($\bar{x}$), regression coefficient (b) and deviations from regression s^2d for the top twenty genotypes are presented in Table (3). The results indicated that 11 genotypes (No., 15, 32, 38, 44, 46, 47, 53, 57, 59, 60 and 61) had high yielding ability and were more stable having b equal one and s^2d equal zero with high average of grain yield. On the other hand genotypes No.,42 and 50 were less stable because they had (b) being not equal one and s^2d differed significantly from zero ,while genotypes No., 24, 35, 52, 55 and 56 were moderately stable because they had high mean grain yield s^2d equal zero and b did not equal one. In general the aforementioned eleven entries can be cultivated beside the

national check at Nubaria, Giza and Fayoum locations.

Chemical analysis of barley genotypes grain :

The chemical composition of the top twenty barley genotypes grain is summarized in Table (4). Protein content ranged from 12.35 % in entry No., 56 to 14.54% in entry No., 15 respectively. Protein content varied in barley based on growing conditions, with an average value of 13%, which was almost equal to wheat and higher compared to cereal grains (Newman and Newman, 1991). Total carbohydrates ranged from 72.63% in entry No., 35 to 78.28% in entry No., 44, respectively. Barley is an excellent source of carbohydrates, which constituted 80% of barley grain weight (Czuchajowska *et al.*, 1998). Oil, ash and fiber contents ranged between (1.19-2.30%), (2.24-4.03%) and (5.17-6.17%) respectively. These results are in agreement with Rieckhoff *et al.*, (1999).

Fractionation and identification of protein barley genotypes grain :

Barley grain proteins were fractionated by extraction with appropriate solvent to albumin-globulin mixture and hordein. Whereas, glutelin was roughly calculated by difference. The results in Table (5) show the amount of hordein ranged between 33.35 % to 40.87% whereas, albumin-globulin mixtures in the genotypes were from 19.82 % to 23.17% and glutein from 35.96 to 46.83%. The entry No., 15 contained the highest protein (14.54%) indicating the highest hordein and albumin-globulin mixture (40.87 % and 23.17%) respectively. El-Negumy *et al.*, (1979) studied the protein of 23 barley cultivars of various origins. They found that albumin to globulin mixture fractions amounted from 27.5 to 39.8% hordein from17.2 to 36.9% and glutelin from 23.6 to 41.0 %.

Hordein (prolamine) fraction in barley genotypes grain was extracted with isopropanol (50%) in presence of mercaptoethanol (o.4 M). Hordein was splitted into different subunits and fractionated by SDS-PAGE technique. Six subunits were detected with molecular weights, 225.0, 215.0, 210.0, 195.0, 175.0 and 145.0 Kilodaltion (KD) as shown in Table (6) and Fig.(1). These genotypes were divided into three groups in hordein fraction to different subunits. The first group in hordein fraction included six subunits in the entries No., 15, 24, 32, 35, 38, 42, 47 and 63. The major subunit was

that of the molecular weight 225.0 KD, which amounted to 19.06-19.72 relative percentage total protein according to the genotypes as shown by scanner in Table (6). The second group contained the entries No., 52, 53, 57, 59, 60, 61 and 62. Also, the predominated subunit in the five subunits was 215.0 KD, which amounted from 23.04 to 23.37% total protein. The third group represented four subunits contained the entries 44,46,50,55,and 56. From the above-mentioned data, the electrophoretic analysis of hordein is an important factor for the identification of barley genotypes, especially those with no morphological differences. Doll and Anderson, (1981) found that this rather simple method of hordein preparation gave well-resolved sharp protein bands which revealed considerable variation among the genotypes with respect to polypeptide composition of their hordein.

Albumin–globulin mixture of twenty genotypes barley grains were extracted with phosphate buffer pH value 8.0 and fractionated by using SDS-PAGE. This technique allowed dissociation of protein into subunits. The molecular weight of each subunit was estimated according to its migration rates compared to a sample of known molecular weight. From the results reported in Table (7) and Fig (2), the barley genotypes grain showed eight subunits of molecular weight 225.0, 215.0, 210.0, 195.0, 175.0, 145.0, 140.0 and 135.0 KD. For this reason, the relative percentage of total protein of the different band was determined by scanning.The twenty genotypes of barley grains were divided into three groups representing the subunits. The first group contained entries No., 15, 24, 32, 35, 38, 42 and 47. The second group consisted of seven subunits was included in two subgroups. The first and second subgroups contained entries No., 53, 56, 57 and 62 ,63, respectively. The third group was divided into two subgroups, comprised entries No., 44, 46, 56, 55. The first and second subgroups were entries No., 52, 59, 60, 61 and consisted of six subunits. It could be concluded that albumin-globulin mixture already exhibited the complete pattern of eight bands.

Generally speaking, the present results demonstrate that it is possible to identify barley genotypes by electrophoretic technique (PAGE method) of hordein and albumin-globulin mixture proteins.

Table 1. Names and pedigree of 63 predigree exotic barley genotype tested.

Entry No.,	Names and pedigree
1	Acc # 116134 – Coll # 89032 – 21 / Acc # 116134 – Coll # 89032 – 22 ICB 95 – 0074 – OAP.
2	Acc # 116134 – Coll # 89032 – 21 / Acc # 116134 – Coll # 89032 – 22 ICB 95 – 0076 – OAP.
3	Acc # 116134 – Coll # 89032 – 21 / Giza 123 ICB 95 – 0080 – OAP.
4	Acc # 116132 – Coll # 89023 – 20 / Acc # 11613 – Coll # 89013 – 44 ICB 95 – 0083 – OAP.
5	Acc # 116132 – Coll # 89023 – 20 / Giza 123 ICB 95 – 0088 – OAP.
6	Acc # 116134 – Coll # 89032 – 22 / Acc # 116134 – Coll # 89032 – 26 ICB 95 – 0093 – OAP.
7	Acc # 116132 – Coll # 89023 – 11 / Giza 126 ICB 95 – 0100 – OAP.
8	Acc # 116132 – Coll # 89023 – 11 / Giza 123 ICB 95 – 0100 – OAP.
9	Acc # 116132 – Coll # 89013 – 44 / Giza 123 ICB 95 – 0106 – OAP.
10	Acc # 116134 – Coll # 89032 – 16 / Giza 123 ICB 95 – 0110 – OAP.
11	Giza 123 / Giza 126 ICB 95 – 0115 – OAP.
12	Acc # 116132 – Coll # 89023 – 20 // Arar / PI 386540 ICB 95 – 0780 OAP.
13	IPA 7/6/ Alanda /5/Aths / 4/ Pro / Toll // Cer* / 2/ Toll/3/5106 ICB 95- 0150 – OAP.
14	IPA 7/4/ Baca "S" /3/Ac 253 // CI 08887 / CI 05761 ICB 95- 0151 – OAP.
15	IPA 7// Aths / CI 16155 ICB 95 – 0152 – OAP.
16	IPA 7/ Aw Black / Aths // Arar / 3/9 Cr. 279 – 07 / Roho ICB 95 – 0157 – OAP.
17	IPA 7 / Barbara ICB 95 – 0158 – OAP
18	IPA 7 / 7 / F 6 – 4 – kf / 6 / Man / Huiz / M 69 – 69 / 3 / Apm / R I // H 272 /4/ CP / Bra / 5/ Joso "S" ICB 95 – 0780 – OAP.
19	IPA 7 / / DD – 14 / Rhn – 03 ICB 95 – 0161 – OAP.
20	IPA 7/ Atha ICB 95 – 0170 – OAP.
21	Alanda / 5 / Aths / 4 / Pro / Toll // Cer* 2 / Toll / 3 / 5106 / 6 / Baca "S" / 3 / Ac 253 // CI 08887 / CI 05761 ICB 95 – 0172 – OAP.
22	Alanda / 5 / Aths / 4 / Pro / Toll // Cer* 2 / Toll / 3 / 5106 / 6 / Aths / CI 16155 ICB 95 – 0173 – OAP.
23	Alanda / 5 / Aths / 4 / Pro / Toll // Cer* 2 / Toll / 3 / 5106 / 6 / CalMr / CI 06688 ICB 95 – 0174 – OAP.
24	Alanda / 5 / Aths / 4 / Pro / Toll // Cer* 2 / Toll / 3 / 5106 / 6 / CalMr / CI 16155 / ICB 95 – 0176 – OAP.
25	Alanda / 5 / Aths / 4 / Pro / Toll // Cer* 2 / Toll / 3 / 5106 / 6 / AwBlack / Arar / 279 – 07 / Roho ICB 95 – 0178 – OAP.
26	Alanda / 5 / Aths / 4 / Pro / Toll // Cer* 2 / Toll / 3 / 5106 / 7 / F 6 – 4 – k f / 6 / Man / Huiz / M 69 – 69 / 3 / Apm / R 1 / H 272 / 4 / CP / Bra / 5 / Joso "S" ICB 95 – 0180 – OAP.
27	Alanda / 5 / Aths / 4 / Pro / Toll // Cer* 2 / Toll / 3 / 5106 / 6 / As 46 / Rhn – 05 ICB 95 – 0183 – OAP.
28	Alanda / 5 / Aths / 4 / Pro / Toll // Cer* 2 / Toll / 3 / 5106 / 6 / Api / CM 67 // Mona / 3 / DI // Asse / CM 65 – 1 w – B / 4 / As 1 – 02 ICB 95 – 0187 – OAP.
29	Alanda / 5 / Aths / 4 / Pro / Toll // Cer* 2 / Toll / 3 / 5106 / 6 / Bda / 5 / Cr. 115 / Pro / Bc / 3 / Api / CM 67 / 4/ Giza 120 ICB 95 – 0186 – OAP.
30	Alanda / 5 / Aths / 4 / Pro / Toll // Cer* 2 / Toll / 3 / 5106 / 6 / As 46 / Rhn – 05 ICB 95 – 0187 – OAP.
31	Alanda / 5 / Aths / 4 / Pro / Toll // Cer* 2 / Toll / 3 / 5106 / 6 / Api / CM 67 // 3 / kan ICB 95 – 0188 – OAP.
32	Alanda / 5 / Aths / 4 / Pro / Toll // Cer* 2 / Toll / 3 / 5106 / 6 / Aths ICB 95 – 0191– OAP.

Table 1. Continued

33	AwBlack / Aths / Arar / 3/ 9 Cr. 279 – 07 / Roho / 7 / F 6 – 4 – k f / 6 / Man / Huiz / M 69 – 69 / 3m / R 1 / H 272 / 4 / CP / Bra / 5 / Joso "S" ICB 95 – 0200 – OAP.
34	AwBlack / Aths / Arar / 3/ 9 Cr. 279 – 07 / Roho / 4 / DD – 14 / Rhn – 03 ICB 95 – 0202 – OAP.
35	AwBlack / Aths / Arar / 3/ 9 Cr. 279 – 07 / Roho / 6 / Alanda – 01/5/ CI 01021 / 4 / CM sk. 1800 / Pro / CM 67 / 3 / DL 70 ICB 95 – 0204 – OAP.
36	AwBlack / Aths / Arar / 3/ 9 Cr. 279 – 07 / Roho / 6 / Bada / 5 / Cr. 115 / Pro / Bc / 3 / Api / CM 67 / 4 / Giza / 20 ICB 95 – 0206 – OAP.
37	A w Black / Aths / Arar / 3/ 9 Cr. 279 – 07 / Roho / 4 / Aths ICB 95 – 0211 – OAP.
38	Barbara / 6 / Bad / 5 / Cr. 115 / Pro / Bc / 3 / Api / CM 67 / 4 / Giza 120 ICB 95 – 0219 – OAP.
39	Barbara / As 46 / Rhn – 05 ICB 95 – 0220 – OAP.
40	As 46 / Rhn – 05 / Ca 1 Mr ICB 95 – 0233 – OAP.
41	Rhn – 03 / Anoidium ICB 93 – 0268 – OAP.
42	SLB 15 – 05 / 4 / H. Spont . 96 – 3 / 3 / Roho / Alger / Cer*es 362 – 1 – 1 ICB 93 – 0700 – OAP.
43	Lignee 527 / 5 / As 54 / Tra / Cer* 2 / Toll / 3 / Avt / Toll / Bz / 4 / Vt / Pro // Toll / 6 / UC / 5 / M 64 – 76 / Bon / Jo / York / 3 / M 5 / Galt / As 46 / 4 / Hj 34 – 80 / Astrix ICB 93 – 0830 – OAP.
44	Arar / Lignee 527 // Arar / PI 386540 ICB93– 0886 – OAP.
45	Lignee 527 / 5 / As 54 / Tra / Cer* 2 / Toll / 3/ Avt / Toll / 3 / Avt / Toll / Bz / 4 / Vt / Pro / Toll / 6 / Arar / Comp. Cr. 29 / C 63 ICB 93 – 0946 – OAP.
46	Arar / Lignee 527 / / Pyo ICB 93 – 1037 – OAP.
47	Hml / Galleon ICB 93 – 1096 – OAP.
48	Arar / PI 386540 / Giza 121 / Pue / 4 / Srs / 3 / Mari / Aths* 2 // Arizona 5908 / Aths ICB 93 – 1236– OAP.
49	Aths / Lignee 686 / 5 / ID 7 CM 67 // Asse / Nacta / 4 / Zoap / Mcu 3021 – 5 D / Ben / 3 / Bco Mr // Ds / Apro ICB 93 – 1256– OAP.
50	JLB 70 – 01 / 5 / Deir Allo 106 // DL 70 / Pyo / 3 / RM 1508 / 4 / Arizona 5908 / Aths / Avt / Attiki / 3 / Ager ICB 90 – 0412– 42 Ap - OAP.
51	Deir Alla 106 // DL 71 / Strain 205 / 3 / DL 529 ICB 90 – 0058 – 31 Ap. OAP.
52	Deir Alla 106 / 3 / As 46 // Avt / Aths / 5 / As 46 / Pro // Bal. 16 / Api / 3 / Mat. Ress 209/ 416 /Deir Alla 106 / Cel / 3 / Bco Mr / Mzq / Apm / 5106 ICB 90 – 0374 – 27 AP – OAP.
53	Lignee 131 / Arabi Abiad / Hml – 02 / Roho ICB 90 – 0026 – 19 Ap OAP
54	ER / Apm / 3 / Arr / Esp // Alger / Cer*es 362 – 1-1 / 4 / Moroc 9 – 75 / Pm B ICB 91 – 0609 – 2 APH – OAP – OAP
55	Roho / Arabi Abiad / ND 7014 / Bowman ICB 91 – 0692 – 19 APH - OAP – OAP
56	Lth / 3 / Nopal // Pro / 11012 – 2 / 4 / Antares // 12201 / Attiki / 3 / R M 1508 / Por // WI 2269 ICB 91 – 0746 – 4 APH – OAP – OAP
57	H. Spont. 41 – 1 / Tadmor / 37 ER / Apm // Lignee 131 ICB 91 – 0455 – 8 ApH – OAP – OAP
58	Lignee 527 / NK 1272 // JLB 70 – 63 ICB 90 – 0399 – 60 Ap – 1 Ap – 1 Ap – OAP
59	Mari / Aths* 3 – 01/ 5 / Mzq / Ben / H272 / 3 / Deir Alla 106 / 4 / Manker / slr / CP CYB – 5245 – 1 Ap – 1 Ap – 1 Ap – OTR – OAP.
60	California Mariout.
61	Athenais
62	Giza 125
63	Giza 126

Table 2. Average performance of heading date, maturity date, plant height and grain yield, spike length (S.L.), 1000 Kernel weight (K.W.), Powdery Mildew (P.M.) and Leaf Rust (L.R.) for 63 barley genotypes over two seasons in Giza (G), Nubaria (N) and Fayoum (F) and combined (C).

Entry	Heading date (day)				Maturity date (day)				Plant height (cm)				Grain yield (Ardab/Fed)				S.L	K.W	P.M	L.R
No.	G	N	F	C	G	N	F	C	G	N	F	C	G	N	F	C	G	G	N	N
1	87.5	93.0	85.0	88.5	129.0	134.0	125.0	129.3	114.0	86.5	87.0	95.8	16.82	7.59	9.30	11.24	4.8	42.40	0-0	50s
2	85.0	97.0	86.5	89.5	127.5	133.0	126.0	128.3	122.0	91.0	67.0	93.3	12.50	8.83	6.90	9.41	7.0	41.84	7-4	70s
3	89.0	91.0	83.0	87.7	131.5	133.5	124.5	129.8	127.0	92.0	76.0	98.3	22.60	17.51	9.25	16.45	5.0	43.20	0-0	80s
4	84.0	90.5	80.0	82.8	162.0	131.5	119.0	125.5	121.0	84.0	53.5	86.2	23.00	11.16	10.60	14.92	6.0	43.82	8-6	90s
5	85.5	90.5	82.5	86.1	132.0	134.5	127.5	131.3	120.0	84.5	74.5	93.0	23.00	17.51	12.55	17.68	8.0	41.16	0-0	90s
6	89.0	92.0	84.5	88.5	129.5	134.0	123.0	128.8	126.5	85.5	80.5	97.5	11.05	13.64	7.25	10.64	4.5	45.74	0-0	100s
7	85.5	98.5	88.0	90.7	131.5	135.0	131.0	132.5	112.0	97.5	78.0	95.5	19.90	8.83	10.80	13.17	6.0	46.24	6-4	20s
8	86.0	92.5	83.5	87.3	133.0	134.0	124.5	130.7	118.0	84.0	75.5	92.5	22.25	10.54	9.25	14.01	5.0	43.72	0-0	80s
9	83.0	89.5	82.5	85.0	125.0	131.0	121.0	125.8	120.0	96.0	86.0	94.7	23.10	11.31	11.25	15.22	7.0	44.78	0-0	80s
10	87.5	97.0	85.5	90.0	126.5	134.5	125.5	128.9	113.5	91.0	89.0	97.8	20.00	14.88	6.75	13.87	8.5	42.72	9-9	80s
11	85.5	86.0	80.0	83.8	131.0	134.0	121.0	128.7	118.0	105.0	74.0	99.0	16.00	9.92	15.25	13.72	10.0	40.78	7-4	10ms
12	84.0	91.5	82.5	86.0	131.0	135.0	122.0	129.3	118.0	97.0	60.5	91.8	20.00	7.44	10.60	12.68	10.0	30.58	0-0	40ms
13	85.5	89.0	83.5	86.0	132.0	134.0	124.0	130.0	120.0	89.0	62.0	90.3	22.00	8.99	6.50	14.49	7.0	34.64	0-0	50s
14	79.5	88.0	79.5	82.3	127.0	132.5	119.5	126.3	117.5	93.0	73.0	99.5	22.60	8.83	10.10	13.84	5.0	38.14	7-6	50ms
15	84.5	89.5	80.0	84.7	130.5	133.5	120.0	128.0	112.0	81.0	94.0	95.7	21.50	15.76	18.15	18.47	4.5	37.34	0-0	10ms
16	79.0	80.5	79.0	81.1	126.0	132.0	120.5	126.2	116.0	91.0	64.5	90.5	21.05	11.62	11.50	14.72	6.5	30.50	0-0	60s
17	86.5	82.0	83.0	83.5	133.0	135.5	121.0	129.8	123.5	92.5	95.5	3.8	20.25	5.89	11.35	12.49	6.0	33.30	0-0	30ms
18	85.0	89.5	80.0	84.3	132.5	135.0	120.0	129.2	102.5	96.0	77.0	91.8	22.00	7.90	15.60	15.16	6.5	35.14	0-0	60s
19	83.0	89.0	80.5	84.1	130.0	134.0	119.0	127.7	121.5	101.5	68.0	97.8	20.60	13.17	10.50	14.75	7.0	41.44	0-0	40ms
20	83.0	88.0	80.0	83.7	132.0	123.5	118.0	127.5	117.0	85.5	86.0	96.2	17.25	10.23	19.25	15.57	5.0	39.34	0-0	50s
21	79.0	81.0	78.5	79.5	127.0	130.5	116.0	124.5	109.0	86.5	63.0	86.8	21.50	19.06	17.70	19.42	8.5	40.32	0-0	40s
22	84.5	85.0	78.5	82.7	131.0	133.0	120.0	127.8	122.0	90.0	74.5	95.8	18.55	13.17	10.40	14.04	7.5	36.96	0-0	80s
23	82.5	61.5	82.5	85.5	132.0	132.5	121.5	128.7	117.5	101.0	60.5	93.0	10.05	8.52	8.80	9.12	9.0	40.88	0-0	60s
24	82.0	82.0	83.0	82.0	132.0	132.5	123.5	129.3	119.5	94.0	70.5	94.7	18.80	16.96	19.40	18.32	8.0	37.98	0-0	30s
25	79.5	83.5	78.0	80.3	126.5	133.0	118.5	126.0	125.5	89.0	81.0	88.3	22.65	17.36	15.40	18.74	8.5	42.56	0-0	70s
26	83.0	89.5	82.0	84.8	129.5	135.0	123.0	129.2	110.0	79.0	70.0	96.3	26.50	13.48	10.75	16.91	6.5	37.56	0-0	60s
27	84.5	88.5	82.5	85.1	131.5	132.5	123.5	128.2	127.5	91.0	77.0	88.5	16.50	12.86	10.75	13.20	8.5	38.74	0-0	80s
28	83.5	84.0	74.5	80.7	131.5	134.0	118.0	127.8	115.0	80.5	64.0	86.5	19.05	11.16	9.80	13.33	5.0	33.44	0-0	80s
29	82.0	90.0	81.5	84.5	130.5	134.5	121.0	128.7	114.0	89.0	64.5	89.2	23.50	17.36	12.00	17.62	8.0	34.10	7-5	50s
30	83.0	90.5	82.0	85.1	131.5	134.5	122.0	129.3	118.0	101.5	81.0	80.2	23.00	8.52	9.70	13.74	6.0	30.60	0-0	50s
31	81.5	82.5	73.0	79.0	134.5	133.5	120.5	129.5	110.0	81.0	62.0	84.3	19.05	17.36	12.15	16.18	5.5	34.86	0-0	80s
32	79.0	76.5	78.0	81.2	125.5	134.0	120.5	126.8	117.5	91.5	74.0	94.3	32.15	16.62	16.00	18.59	7.0	38.56	0-0	30ms
33	77.0	79.5	74.5	77.0	128.5	133.5	120.0	127.3	114.5	83.5	73.5	90.5	23.90	14.72	14.25	17.62	6.0	45.42	0-0	60s

Table 2. Continued

34	83.5	82.0	73.5	79.7	130.5	131.5	120.5	127.5	114.5	96.5	62.0	91.0	18.80	13.02	10.30	14.04	8.0	47.00	0-0	50s
35	76.5	86.5	73.5	78.8	125.5	132.5	118.5	125.5	125.5	92.5	74.0	79.3	27.85	16.18	12.80	18.04	6.5	39.44	0-0	20s
36	80.5	87.0	82.5	83.3	130.0	133.0	120.0	127.8	120.0	93.5	79.5	97.7	23.50	12.24	16.60	17.44	7.0	73.22	0-0	50s
37	79.0	90.0	81.5	83.3	128.5	132.5	120.5	127.2	103.0	98.5	79.5	93.7	21.80	6.51	8.05	12.12	6.5	30.94	0-0	60s
38	83.5	87.5	84.0	85.0	126.5	133.5	123.5	127.8	128.0	99.0	73.0	103.3	27.50	19.53	14.00	20.34	7.0	38.98	0-0	5 m r
39	84.0	89.5	81.0	84.8	132.5	134.5	121.5	129.8	120.0	90.5	75.0	95.2	21.00	7.08	11.05	13.23	7.5	34.10	0-0	30ms
40	85.0	91.5	83.5	86.7	131.5	135.0	125.0	130.5	128.0	92.5	76.5	99.0	19.47	11.16	10.75	13.79	7.0	34.58	0-0	80s
41	86.5	89.0	83.0	86.2	127.5	134.5	124.5	128.8	107.0	92.0	66.0	88.3	17.00	8.13	10.55	11.89	6.0	30.04	0-0	20ms
42	80.5	86.5	77.0	81.3	123.5	132.5	188.0	124.7	110.0	86.0	73.0	89.7	24.50	16.64	15.55	18.89	7.5	33.86	0-0	5m r
43	84.0	90.0	80.5	84.8	133.5	134.0	120.0	129.2	119.5	96.5	78.5	98.2	18.55	12.94	15.20	15.56	8.0	41.14	0-0	60s
44	83.0	87.0	73.5	81.2	129.0	134.5	120.5	128.0	115.5	99.0	93.5	12.7	23.10	15.26	17.65	18.67	10.0	36.14	0-0	20ms
45	88.0	91.5	75.5	88.5	136.0	135.5	130.0	133.7	118.0	96.0	91.0	101.7	15.55	8.83	11.00	11.79	10.5	33.10	0-0	70s
46	81.0	79.0	75.0	78.3	130.0	134.0	120.5	128.5	117.0	96.5	71.5	95.0	26.80	16.88	12.50	18.06	7.0	31.00	0-0	30ms
47	82.0	87.5	82.0	83.8	130.0	133.0	121.5	128.2	117.5	87.5	71.5	92.2	21.10	16.74	15.90	17.91	7.5	42.98	0-0	40ms
48	82.0	89.0	78.0	84.7	128.0	134.5	126.0	129.5	114.0	97.5	69.0	93.5	18.60	14.83	14.70	16.04	6.5	30.98	0-0	5m r
49	82.0	87.0	80.0	83.2	131.5	134.5	122.0	129.3	118.5	95.0	80.0	97.8	21.50	9.61	10.20	13.77	9.0	36.48	0-0	60s
50	74.5	83.5	80.0	78.7	124.5	133.0	120.0	125.8	114.5	97.5	90.5	100.8	26.80	18.13	12.25	19.06	10.5	42.60	0-0	10ms
51	82.5	89.9	82.0	83.8	126.5	133.0	120.0	126.3	113.5	83.5	83.0	93.3	19.25	14.88	8.75	14.29	5.0	33.48	0-0	30ms
52	85.0	90.0	78.0	85.7	132.5	134.5	121.5	129.5	120.5	96.5	89.5	102.2	16.75	20.92	17.55	18.40	7.0	36.24	0-0	10mr
53	82.0	88.5	80.5	82.8	128.5	134.0	121.0	127.8	118.0	84.5	66.5	89.7	23.50	16.74	15.25	18.49	6.0	43.24	0-0	15ms
54	81.5	89.0	80.5	83.7	124.5	133.5	119.0	125.7	110.5	66.5	75.0	84.0	23.00	14.57	7.00	14.85	8.0	47.58	0-0	30ms
55	83.0	89.5	84.0	84.3	126.0	134.0	120.0	126.7	115.5	72.5	87.5	91.8	22.00	17.51	17.00	18.83	8.0	45.08	0-0	5ms
56	83.5	91.0	82.0	86.2	129.0	134.0	122.5	127.8	123.5	84.5	95.5	101.2	20.00	19.28	16.25	18.51	8.5	47.90	0-0	10mr
57	85.5	98.5	74.5	88.2	133.0	140.0	123.5	123.8	114.5	84.0	73.5	90.7	24.50	16.47	14.50	18.49	7.0	39.22	7-6	40ms
58	76.0	79.5	72.0	76.7	131.0	127.5	124.5	129.1	118.0	85.0	57.0	86.7	21.85	11.78	6.10	13.24	6.0	37.18	0-0	20ms
59	78.5	81.0	79.0	77.2	129.5	132.0	120.0	127.1	113.5	99.5	82.5	88.5	24.00	15.64	17.20	18.94	6.0	42.42	7-5	30s
60	84.0	91.0	79.0	84.7	131.0	134.0	120.0	128.1	114.5	98.5	82.0	98.3	26.50	17.51	13.75	19.25	7.0	40.82	0-0	50s
61	78.5	90.0	79.0	82.7	17.0	130.0	120.0	125.6	129.0	93.5	71.0	101.2	23.55	17.82	16.25	19.20	7.0	40.78	9-7	30s
62	85.5	89.5	85.0	86.7	132.0	133.5	125.5	131.0	108.0	97.5	81.0	95.5	21.00	16.74	12.80	16.84	6.0	43.48	0-0	50s
63	85.5	96.5	87.5	89.8	130.5	136.0	131.0	132.5	114.0	86.5	89.0	99.0	22.50	14.02	12.25	16.25	8.0	41.16	8-3	50s
¯ x	82.9	88.4	80.6	84.0	129.6	133.6	121.9	128.2	117.2	90.8	75.6	94.5	20.75	13.19	11.97	15.30	7.0	39.60	- -	- -
c.v	1.63	3.01	1.24	2.21	0.80	0.96	1.17	0.98	4.03	4.52	4.52	3.74	19.69	15.29	19.34	16.15	7.59	10.04	- -	- -
LSD at 5%	2.7	5.7	2.0	2.1	2.1	2.5	2.8	2.3	9.4	3.7	6.8	4.0	3.84	2.35	3.60	1.44	2.5	2.11	- -	- -

Table 3. Stability parameter of grain yield for top twenty barley genotypes.

Genotype No.	$\bar{X}$	b	S^2 d
15	18.47	0.85	0.199
24	18.32	0.50**	0.075
32	18.59	0.97	0.026
35	18.04	1.59*	0.239
38	20.34	1.33	0.123
42	18.89	1.37*	0.976*
44	18.67	0.81	0.031
46	18.06	1.26	0.140
47	17.91	0.72	0.104
50	19.06	1.61*	1.38**
52	18.40	0.29**	0.100
53	18.49	0.85	0.013
55	18.83	0.57**	0.37
56	18.51	0.34**	0.045
57	18.49	1.10	0.030
59	18.94	0.86	0.080
60	19.25	1.20	0.050
61	19.20	0.81	0.18
62	16.84	0.74	0.13
63	16.25	1.10	0.06

P* = 0.05 P** = 0.01

Table 4. Chemical analysis of top twenty barley genotypes (on dry weight basis).

Entry No.	Protein	Oil	Ash	Fiber	Total carbohydrates
15	14.54	1.19	3.64	6.85	73.78
24	14.34	2.08	2.24	5.51	75.83
32	13.83	2.25	3.37	6.51	74.11
35	13.94	2.23	4.03	7.17	72.63
38	14.40	1.97	3.39	6.48	73.76
42	13.70	2.01	3.24	6.39	74.67
44	12.37	1.56	2.29	5.17	78.28
46	12.47	2.05	2.87	5.92	76.69
47	14.01	1.95	3.12	6.25	74.68
50	12.67	1.79	2.55	5.23	77.76
52	13.41	2.25	3.75	6.82	73.77
53	13.10	1.81	2.97	5.84	76.61
55	12.48	2.13	2.72	5.64	77.03
56	12.35	2.11	2.51	5.78	77.25
57	12.96	1.95	3.01	6.27	75.81
59	13.22	1.83	2.73	5.47	76.75
60	13.25	1.78	2.51	5.74	76.72
61	13.22	1.85	2.49	5.63	76.81
62	13.11	2.17	3.00	6.07	75.65
63	13.71	2.30	3.13	6.35	77.51
L.S.D at 5%	0.61	0.30	0.61	0.40	0.48

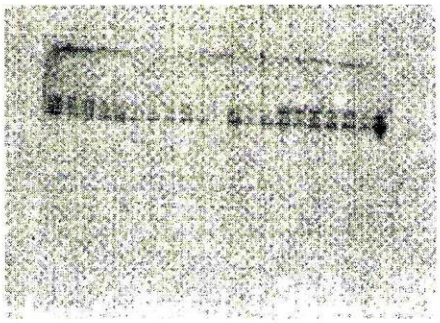
Table 5. Fractions of protein barley genotypes.

Protein fraction	Entry number																				L.S.D at 0.05
	15	24	32	35	38	42	44	46	47	50	52	53	55	56	57	59	60	61	62	63	
Hordein	40.87	37.83	37.34	37.64	38.88	36.99	33.50	33.69	37.70	34.21	36.21	35.37	33.40	33.35	34.99	35.69	35.78	35.70	35.40	37.02	1.49
Albumin + Globulin	23.17	21.81	21.60	21.73	22.28	21.44	19.94	19.98	22.98	20.20	20.09	20.72	19.84	19.82	20.55	20.86	20.90	20.86	20.73	21.45	1.42
Glutelin	35.96	40.36	40.06	40.63	38.84	41.57	46.56	46.33	40.32	45.59	42.70	43.91	46.76	46.83	45.46	46.45	43.32	43.44	43.87	41.53	1..20

Table 6. Scanning of hordein subunits extracted by isopropanol and mercaptoethanol.

M.W.*	Entry number																			
	15	24	32	35	38	42	44	46	47	50	52	53	55	65	57	59	60	61	62	63
225.0	19.35	19.44	19.59	19.57	19.38	19.30	--	--	19.06	--	--	--	--	--	--	--	--	--	--	19.72
215.0	18.25	18.34	18.72	18.47	18.29	18.42	--	--	18.28	--	23.31	23.31	--	--	23.37	23.15	23.04	23.07	23.23	18.84
210.0	18.07	18.14	17.96	18.10	17.93	18.16	29.41	28.96	18.03	28.70	22.36	22.99	29.40	29.52	22.62	22.69	22.58	22.61	22.56	18.40
195.0	16.78	16.60	16.94	16.71	16.80	17.11	26.90	26.89	16.89	26.74	20.50	21.22	27.14	26.83	20.55	20.06	20.52	20.87	21.02	16.83
175.0	15.06	15.12	14.16	14.52	15.08	14.21	23.37	24.14	15.16	24.36	18.10	16.46	22.97	23.07	17.67	17.73	18.11	17.67	17.23	13.40
145.0	12.48	12.35	12.62	12.61	12.49	12.72	20.31	20.00	12.56	20.18	15.72	16.01	20.48	20.57	15.76	15.81	15.73	15.76	15.86	12.71

M.W. Molecular weight of protein marker



SDS-PAGE separation of hordein in twenty barley genotypes

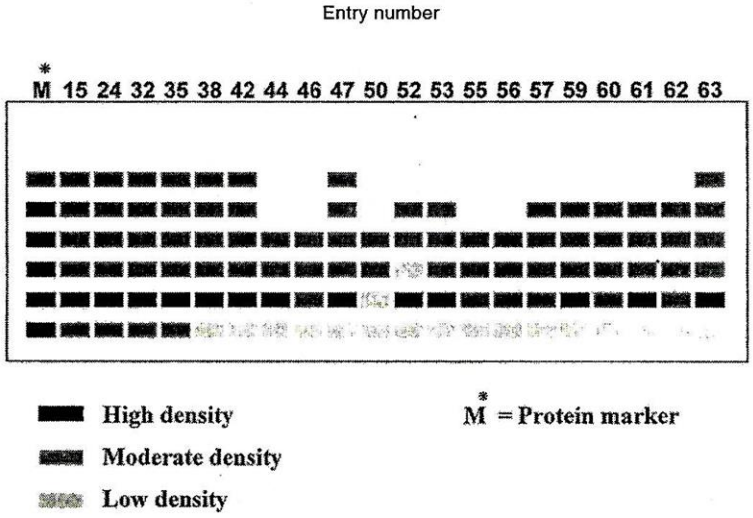
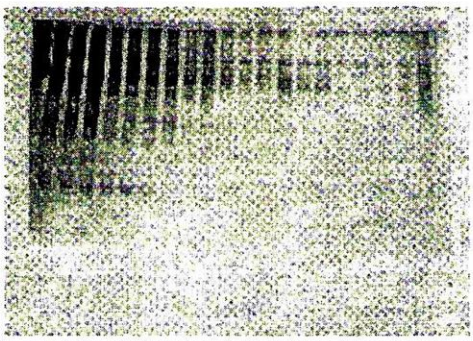


Fig 1. Diagram of hordein electrophoregrams of barley genotypes.

Table 7. Scanning of soluble protein (albumin–globulin) mixture subunits extracted by phosphate buffer

M.W.*	Entry number																			
	15	24	32	35	38	42	44	46	47	50	52	53	55	65	57	59	60	61	62	63
225.0	15.65	15.70	15.80	15.79	15.67	15.51	--	--	15.37	--	--	--	--	--	--	--	--	--	18.63	18.65
215.0	14.77	14.82	15.10	14.90	14.79	14.93	--	--	14.74	--	21.69	17.87	--	17.99	17.59	21.61	21.52	21.51	17.57	17.82
210.0	14.61	14.66	14.48	14.61	14.49	14.65	21.23	21.00	14.54	20.76	--	17.63	21.17	17.14	17.12	--	--	--	--	--
195.0	13.56	13.41	13.69	13.48	13.58	13.80	19.42	19.50	13.62	19.34	19.08	16.27	19.54	15.82	16.42	19.25	19.17	19.46	15.90	15.93
175.0	12.17	12.21	11.42	11.71	12.19	11.51	16.87	17.50	12.23	17.16	16.84	12.62	16.54	13.61	13.53	16.55	16.92	16.79	13.10	12.71
145.0	10.08	9.98	10.18	10.17	10.10	10.26	14.66	14.50	10.13	14.59	14.63	12.28	14.75	12.13	12.21	14.76	14.70	14.69	12.00	12.02
140.0	9.74	9.77	9.83	9.83	9.75	9.91	14.15	14.00	9.78	14.09	14.12	11.86	14.24	11.71	11.73	14.25	14.19	14.18	11.59	11.61
135.0	9.39	9.42	9.48	9.47	9.40	9.42	13.65	13.50	9.30	13.59	13.62	11.43	13.73	11.29	11.27	13.55	13.49	13.67	11.17	11.19

M.W. Molecular weight of protein marker



SDS-PAGE separation of albumin-globulin mixture in twenty barley genotypes

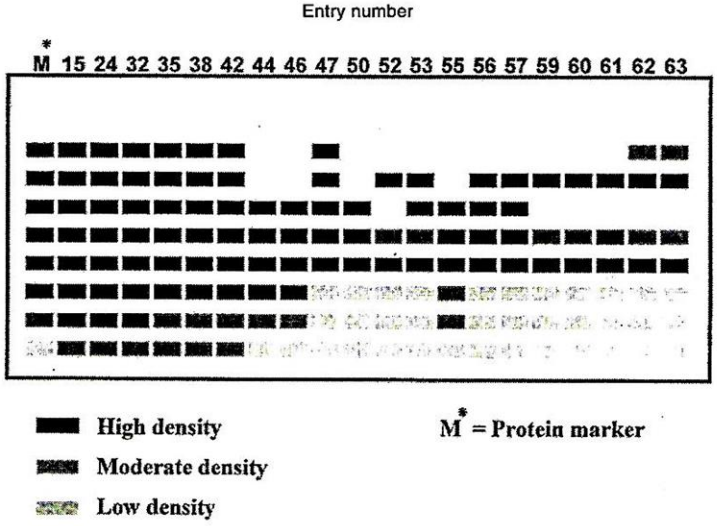


Fig 2. Diagram of (albumin - globulin) mixture electrophoregrams of barley genotypes.

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تقييم محصولى وكيماوى حيوى لبعض التراكيب الوراثية المستوردة للشعير

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١ قسم بحوث الشعير - معهد بحوث المحاصيل الحقلية - مركز البحوث الزراعية - جيزة - مصر.

٢ قسم بحوث تكنولوجيا المحاصيل - معهد بحوث تكنولوجيا الأغذية - مركز البحوث الزراعية جيزة - مصر.

تهدف هذه الدراسة إلى تقييم بعض التراكيب الزراعية المستوردة من المركز الدولى للبحوث الزراعية فى المناطق الجافة لاختيار أفضل هذه التراكيب من حيث الإنتاج العالى والثبات المحصولى والمقاومة للأمراض. وقد تم تقييم ٦٣ تركيب وراثى فى ثلاث مناطق (النوبارية - الفيوم - الجيزة) فى موسمى ١٩٩٨ - ١٩٩٩ و ١٩٩٩ - ٢٠٠٠ وكان التقييم الإحصائى المستخدم هو قطاعات كاملة العشوائية فى ثلاث مكررات.

وفيما يلى أهم النتائج :

- أوضحت النتائج وجود ٦ تراكيب وراثية مبكرة بمقدار ٩ أيام عن صنف المقارنة جيزة ١٢٥
- أثبتت النتائج وجود عشرة تراكيب وراثية أطول من صنف المقارنة بمتوسط قدره ٩ سم.
- أظهرت السلالات أرقام ٥٦ و ٣٤,٥٤ و ٧ و ٦ أعلى وزن للألف حبة.
- أمكن التوصل إلى ٢٠ تركيبة وراثية ذات محصول عالى ومقاومة لمرض البياض الدقيقى وصدأ الأوراق.
- وقد بين تحليل الثبات لمحصول الحبوب وجود ١١ تركيب وراثى (١٥ - ٣٢ - ٣٨ - ٤٤ - ٤٦ - ٤٧ - ٥٣ - ٥٧ - ٥٩ - ٦٠ - ٦١) تتميز بدرجة عالية من الثبات ويمكن زراعتها فى هذه المناطق.
- أعطت التركيبة الوراثية (١٥) أعلى نسبة مئوية للبروتين ١٤,٥٤ ٪ فى حين أعطت التركيبةالوراثية رقم (٤٤) أعلى نسبة مئوية للكربوهيدرات ٧٨,٢٨ ٪.
- تم فصل البروتينات إلى الهورودين و (الالبيومين - جلوبيولين) المخزنة فى البذور للتراكيب الوراثية المتفوقة وعددها ٢٠ تركيبة وراثية وتفريدها على جهاز الجيل إلكتروفوريسيس وأمكن من خلالها التفريق بوضوح بين التراكيب الوراثية على الرغم من أن بعض السلالات أعطت أنماطا متشابهة أثناء التفريد إلا أنه يمكن تمييزها عن بعضها البعض بواسطة بعض الفروقات فى المكونات الثانوية.