# EVALUATION OF CERTIFIED AND FARMER-SAVED SEEDS OF SOME WHEAT (TRITICUM AESTIVUM L.) CULTIVARES.

**AMAL HASSAN SELIM**

*Seed Tech.Res.Dept., FCRI, ARC, Giza, Egypt*

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***Abstract***

Certified and farmer saved seeds for one year are suggested for wheat production but seed resulted from further regenerations of farmer- saved seed should be neglected. The present study aimed to verify genetic purity and planting value of three wheat cultivars using morphological , physiological and biochemical characters as well as grain yield of each tested cultivar . Two field trails were carried out at El-Gemmiza experimental station, Delta region,Egypt, during 2002/03 and 2003/04 growing seasons and laboratory tests were conducted in parallel at Seed Technology Research Section, Agricultural Research Center, Giza, Egypt.The results indicated that the percentage of off-types , and diseased plants increased as the farmer relied on himself for preparing seeds for crop production.The grain yield and genetic purity based on number of off-types and seed fingerprint were significantly reduced from planting second genration of farmer-saved seeds compared with those from standard and certified seeds. It is possible to utilize farmer-saved seed for one year (first generation of certified seed , farmer's previllage), provided that the farmer takes out the off types from the part of his field he keeps for next planting.Planting value of seed from different sources as measured by laboratory tests including germinability and electrical conductivity, and field performance of the seed came to the same conclusion.

## INTRODUCTION

Wheat seeds for planting purpose are resulting from multiplication of basic seeds which should be 100% pure and true to variety (Kelly 1989) . During multiplication , seed contamination can take place from the field with seeds of other varieties, crops and weeds ; contamination from drills, combines, trailess and processing (Svensson *et al.* 1975) . Certified seed should be checked to establish whether the seed lot is of the variety indicated (genuiness of variety) and whether the variety is sufficient pure (varietal purity) .In this concern , activities of post quality control made by official seed authority of the Ministry of Agriculture are limited and poor whether in farmer's field or at official laboratories. On the other hand , farmers occasionally complain from certified seeds and they explain their failure to achieve a good field stand or spread of volunteer plant and building up of disease to planting the certified seed . Thus, there

is a need to check on the validity of farmers complaints and assure that substandard seed does not reach farmers hands. However, most farmers involved in wheat production save a part of their own seed fields for planting in the next season. Such seeds do not undergo field inspection and laboratory testing as certified seeds. Because of the previous reasons,the main objectives of this study are : to assure that certified seed lots that sold the farmers of high quality seed (pure, true to type, free from other crops and diseases) as compared to famer-saved seed ; to check on the effectiveness of quality control operation (field inspection, seed testing); and to act as a check for possible complaints from farmers; and to follow up the performance of farmer-saved seeds to measure their deterioration particularly when several regenrations of the farmer-saved seeds are used.

## MATERIALS AND METHODS

Seed samples of three wheat cultivares namely Sids1; Giza 168 and Sakha 93 were collected from different sources ; reference samples or breeder seeds (R.S) were supplied by National Wheat Research Program, A.R.C.; certified samples (C.S) were supplied by the Central Administration for Seed Production (CASP),Ministry of Agriculture and Land Reclamation; farmer saved seeds which were saved for one year (F.S.S.1); two years (F.S.S.2) and three years (F.S.S.3) were secured by personal communication with seed growers at Gharbia and Dekahlia governorates, Delta region, Egypt.Two field experiments were carried out at El-Gemmieza Agricultural station, Gharbia Governorate, during 2002/2003 and 2003/2004 growing seasons. Each experiment was arranged in a randomized complete block design with four replications. Plots consisted of single rows 30 cm a part. Plot size for quality control was10.5 $m^2$ and contained at least 4000 plants. Optimal cultural practices were followed as recommended for growing wheat crop.Observation was taken at all growth stages in order to decide on the identity and uniformity of the plants. Data were also recorded on a random samples of 100 guarded plants in each row of each experiment i.e., number of spikes/$m^2$; number of kernel/spike; mean of 1000 kernel weight; grain yield/ feddan (ard) off type , oat and diseased plants as well as percentage of identical plants. plots were harvested in May, 22 and 29 2003 and 2004, respectively.Cleaned seeds from each plot were packed seperately for further uses (laboratory experiments). Off types counts were compared with field standard using statistical techniques.

Laboratory test were included the phenol test and cultivar fingerprinting using iso- electric focusing technique as recommended by International Seed Testing Associations (ISTA, 1999) . For testing colour reaction to phenol solution , the procedures outlined by (Olsen,1975) were followed .The grains were soaked in distilled water for 24 hours and then placed in petri dishes on filter paper which was well moistened with an approximately 1% phenol solution. Standard refernces method namely IEF-PAGE (isoelectric focusing poly acrylamide gel electrophoresis) based on gliadins separation was used. 200 seeds (4 replications 50 seeds each) from different sources (R.S, C.S., F.S.S.1, F.S.S.2 and F.S.S.3) were included to verify the genetic purity. Single seed were ground with a single-seed-grinder to a fineness of less than 0.5 mm in size. The ground single seed sample was put into a 1.5 m plastic centrifuge tube and protein extraction solution of 0.05 sodium chloride containng 20% (W/V) sucrose and 0.4% (W/V) methyl green was added to the tube in a 1:1 (W/V) ratio. Suspensions were agitated twice within 10 minutes and were centerfuged for 15 minutes at 10000xg. The supernatants were applied to gels immediately. Sample size ranged from 5 to 15 µL. Electrophoresis was performed at 2500 V, 20° C for 410 rh, with a current of 5 mA.

Data were exposed to the proper statistical analysis of variance of a randomized complete block design using SAS (1990). L.S.D. at 5% level of significancy was used to compare between means of different variables.

## RESULTS AND DISSCUSSION

Table (1) shows that the performance of certified seeds under laboratory and field conditions was better than farmer-saved seeds., specially when the comparison was made between certified seeds or the first generation of farmer –saved seed and those of 3 years. The percentage of field emergence to laboratory germination (Relative field emergence) for certified seed was higher than those of farmer-saved seeds. These results show also that the germination percentage written on the lable of certified seed bag of great value to the farmer whereas farmer-saved seeds had unknown generation value to the farmer. The electrical conductivity of the steep water of farmer-saved seeds was higher than that of certified seeds specially when the farmer rely on himself for providing seeds for planting purpose. The higher the conductivity

value the poorly the seed quality, this means that certified seed of low electrical conductivity (EC) value had better quality than farmer-saved seeds of high (EC) value. As to the percentage of seed responsed positively to phenol solution, the results indicated that it was significantly high for certified seeds as compared with farmer-saved seeds. The percentage of seed did react to phenol treatment increased as the multiplication number of farmer-saved seed increased, so that it ranged between 14-19% when the farmer used his own seeds for 3 years. This might be indicated that there was a number of seeds did not represent the cultivar in qeustion (not true to type). Plants resulted from impure seed can be an evenue for spreading of diseases to those grown from certified seeds (Kelly 1988) .

Table 1. Laboratory germination (%), Field emergence (%), Relative Field emergence (%), electrical conductivity and phenol reaction (%) of wheat seeds from various sources . Combined data of 2002/2003 and 2003/2004 seasons.

| Cultivar Seed sources | Lab. Germination (%) | Field emergence ( %) | Relative Field emergence | EC umhs/cm$^2$ | Phenol Test (%) |
|---|---|---|---|---|---|
| Sids 1 | | | | | |
| R.S | 98 | 92 | 92.5 | 24.1 | 99 |
| C .S | 96 | 88 | 91.7 | 24.2 | 98 |
| F.S.S 1 | 93 | 85 | 91.4 | 26.3 | 90 |
| F.S.S 2 | 90 | 81 | 90.0 | 28.6 | 88 |
| F.S.S 3 | 90 | 82 | 91.1 | 28.8 | 86 |
| L.S.D.at 5% | 2.5 | 1.7 | 2.1 | 1.5 | 3.1 |
| Giza 168 | | | | | |
| R.S | 97 | 92 | 92.7 | 25.3 | 99 |
| C.S | 94 | 88 | 93.6 | 25.6 | 96 |
| F.S.S. 1 | 93 | 86 | 92.0 | 26.1 | 93 |
| F.S.S. 2 | 93 | 87 | 93.6 | 25.9 | 90 |
| F.S.S. 3 | 90 | 83 | 92.0 | 28.1 | 85 |
| L.S.D. at 5% | 2.1 | 2.1 | 1.8 | 1.4 | 3.7 |
| Sakha 93 | | | | | |
| R.S | 96 | 91 | 94.7 | 25.2 | 98 |
| C.S | 94 | 86 | 91.0 | 25.2 | 98 |
| F.S.S. 1 | 92 | 85 | 92.0 | 25.9 | 94 |
| F.S.S. 2 | 89 | 81 | 91.0 | 26.4 | 88 |
| F.S.S. 3 | 89 | 80 | 89.9 | 26.8 | 80 |
| L.S.D. at 5% | 2.9 | 2.6 | 2.3 | 1.1 | 5.3 |

Table (2) shows the increase in off-type , oat and diseased plants as the farmer was relied on himself for preparing seeds for crop production. In this case, it was expected that spread of diseases and off-types plant could be negatively affected grain yield (Table 3). Generally, the results indicated the importance of the certification system

including field inspection, laboratory testing, and post quality control trials for improving the productivity of wheat crop.

Table 2. Off -Type oat and diseased plants of certified and farmer- Saved seed.Combined data of 2002/2003 and 2003/2004 seasons.

| Cultivar Seed sourses | Off –type plants (%) | Oat plants (%) | Diseased plants (%) | Identical plants (%) |
|---|---|---|---|---|
| Sids 1 | | | | |
| R.S | 1.2 | 0.1 | 2.4 | 98.7 |
| C.S | 2.1 | 1.1 | 2.1 | 97.2 |
| F.S.S.1 | 5.4 | 2.4 | 4.3 | 93.3 |
| F.S.S2 | 8.6 | 4.5 | 7.5 | 87.5 |
| F.S.S.3 | 11.8 | 4.3 | 9.0 | 84.4 |
| L.S.D. at 5% | 1.3 | 1.2 | 3.7 | 6.1 |
| Giza 168 | | | | |
| R.S | 2.1 | 0.2 | 2.2 | 97.2 |
| C.S | 3.2 | 2.2 | 5.5 | 95.1 |
| F.S.S.1 | 6.1 | 3.1 | 8.4 | 89.4 |
| F.S.S.2 | 12.4 | 3.5 | 11.2 | 84.3 |
| F.S.S.3 | 16.5 | 5.7 | 16.4 | 79.1 |
| L.S.D. at 5% | 6.8 | 2.1 | 5.6 | 8.3 |
| Sakha 93 | | | | |
| R.S | 3.0 | 0.4 | 2.1 | 96.5 |
| C.S | 5.0 | 1.5 | 4.5 | 94.3 |
| F.S.S. 1 | 7.2 | 2.4 | 6.4 | 92.1 |
| F.S.S. 2 | 10.1 | 2.6 | 10.8 | 89.5 |
| F.S.S. 3 | 15.4 | 2.7 | 12.6 | 83.2 |
| L.S.D. at 5% | 5.7 | 1.3 | 4.8 | 6.3 |

Table (3) shows the effect of using the certified and the farmer-saved seeds on the number of spikles per meter , number of grains per spike , thousand grain weight and grain yield per faddan, where yield differences using certified seeds and farmer seeds for three generations were 2.4, 1.6,1.3 Ardab/faddan, for Sids 1 , Giza 168 and Sakha 93, respectively.

Table 3. Number of spikes /$m^2$ and kernels/spike, 1000 kernel weight , grain yield of wheat grown from different seed sources. Combined data of 2002/2003 and 2003/2004 seasons.

| Cultivar Seed sources | No.of spikles/$m^2$ | No. of Kernel/spikle | 1000 Kernel weight (g) | Grain yield Ardab/Feddan |
|---|---|---|---|---|
| Sids 1 | | | | |
| R.S | 395 | 55.4 | 42.1 | 18.46 |
| C.S | 392 | 52.9 | 41.3 | 18.21 |
| F.S.S.1 | 388 | 51.3 | 40.8 | 17.67 |
| F.S.S2 | 374 | 50.8 | 41.1 | 16.20 |
| F.S.S.3 | 362 | 50.2 | 40.6 | 15.80 |
| L.S.D. at 5% | 7.6 | 2.4 | 2.3 | 1.66 |
| Giza 168 | | | | |
| R.S | 412 | 46.3 | 46.8 | 18.92 |
| C.S | 411 | 45.3 | 46.2 | 18.66 |
| F.S.S.1 | 405 | 44.2 | 45.8 | 18.02 |
| C.S.S2 | 395 | 42.6 | 44.2 | 17.52 |
| F.S.S.3 | 385 | 42.7 | 45.1 | 17.05 |
| L.S.D. at 5% | 7.1 | 2.7 | 2.1 | 1.56 |
| Sakha 93 | | | | |
| R.S | 382 | 54.2 | 41.8 | 17.56 |
| C.S | 375 | 52.6 | 41.6 | 17.36 |
| F.S.S. 1 | 374 | 50.5 | 40.2 | 17.02 |
| F.S.S. 2 | 365 | 50.2 | 38.6 | 16.08 |
| F.S.S. 3 | 261 | 49.8 | 38.4 | 16.02 |
| L.S.D. at 5% | 6.3 | 2.2 | 2.1 | 1.10 |

Table (4) show that 2 % of certified seeds of the cultivares Sids 1 and Giza 168 had fingerprinting not identical to those of the reference cultivares . For the cultivar Sakha 93, 1% only showed different fingerprint from that of the cultivar (R.S). The percentage of seeds had different fingerprint from that of the cultivar increased as the number of regenerations of farmer- saved seed increased , so that it reached about 20% for F.S.S.3 in the cases of Sids 1 and Sakha 93 .

Table 4. Cultivar purity (%) as measured by fingerprinting of 200 indiviual seeds of three wheat varieties. Data of combined analysis of 2002/2003 and 2003/2004 growing seasons.

| Seed class | Cultivar purity % | | |
|---|---|---|---|
| | Sids 1 | Giza 168 | Sakha 93 |
| R.S. | 99.5 | 99.0 | 98.5 |
| C.S | 98.0 | 96.5 | 98.0 |
| F.S.S.1 | 96.5 | 92.5 | 90.5 |
| F.S.S.2 | 88.5 | 90.5 | 88.0 |
| F.S.S.3 | 80.0 | 86.5 | 80.0 |

The previous results clearfy the fact that the genetic composition of the variety initially developed by the breeder (R.S) must be the same as that marketed to the grower after several regenerations of seed increas. The results indicated also the importance of using certified seed because it is more pure and has less foreign material and diseased seed compare to farmer-saved seed. However, taking into consideration the high cost of certified seed compared to farmer-saved seed, it is possible to use seed of the first regeneration of the certified seed (F.S.S.1) provided that the farmer should rogue the part of his field he keeps for next planting .

## REFERENCES

1- Fenwick,Kelly A. 1988. Seed production of Agricultural Crops. Longman, Harlow. England. P.16-2d.

2- Fenwick,Kelly A. 1989. Seed planning and policy for Agricultural production, The roles of government and private enterprice in supply and distribution , pp. 22-23; Belhaven press, London.

3- ISTA Rules 1999. Proc. Int., Seed Test. Ass., 31 (1): 1-152.

4- Olsen, K.J. 1975. Cultivar identification and purity determination. Seed Sci., & Tech., 3, 615-617.

5- S.A.S. 1990. Statistical Analysis System. 6 th Ed. Institute Incc., Gray. Nc, USA .

6- Svensson , O., Al-Jibouri:, and E.J. Fuentes 1975. Seed certification 163-185 in cereal seed technology FAO.Rome, Italy.

# تقييم التقاوى المعتمدة وتقاوى المزارع فى بعض أصناف القمح

**أمال حسن سليم**

*قسم بحوث تكنولوجيا البذور ، معهد بحوث المحاصيل الحقلية ، مركز البحوث الزراعية ، جيزة ، مصر*

تهدف هذه الدراسة الى التحقق من النقاوة الوراثية والقيمة الزراعية للتقاوى المعتمدة التى تخضع للتفتيش الحقلى والفحص المعملى والتقاوى التى يكثرها المزارع لعدة أجيال دون اعتمادها من جهة الفحص الرسمية . أجريت تجربتان حقليتان بمحطة بحوث الجميزة موسم ٢٠٠٢/٢٠٠٣ ، ٢٠٠٣/٢٠٠٤ لتحديد نسبة النباتات الغريبة عن الصنف المنزرع بأستخدام الصفات المورفولوجية المميزة للصنف المنزرع وكذا المحصول الناتج من استخدام التقاوى المعتمدة مقارنة بالاكثارات المتعاقبة من تقاوى نفس الصنف التى يدخرها المزارع من موسم لآخر . كما أجريت تجارب معملية بمعامل قسم بحوث تكنولوجيا البذور بالجيزة أشتملت على اختبار الانبات ، التوصيل الكهربى ، أختبار الفينول والبصمة الوراثية. وأشتملت التجارب على ثلاث أصناف مستنبطة حديثا تزرع فى مصر على نطاق واسع وهى سدس ١ ، جيزة ١٦٨ ، سخا ٩٣ . أوضحت النتائج المتحصل عليها زيادة نسبة النباتات الغريبة عن الصنف والمصابة بالامراض كلما اعتمد المزارع على نفسه فى اكثار تقاويه واستخدامها فى الزراعة فى الموسم التالى . من ناحية أخرى أبرزت النتائج اهمية استخدام التقاوى المعتمدة فى المحافظة على نقاوة الصنف والحصول على قيمة زراعية عالية للتقاوى تحت ظروف المعمل والحقل وبالتالى تحقيق محصول أفضل عن أستخدام تقاوى المزارع من نفس الصنف . وأوضحت النتائج أيضا انه يمكن للمزارع من ذوى الخبرة بمحصول القمح ان يستخدم تقاوى الجيل الاول الناتج من اكثار التقاوى المعتمدة فى الموسم التالى دون حدوث نقص فى المحصول وذلك بشرط عمل النقاوة اليدوية للنباتات الغريبة عن الصنف وبعض الحشائش مثل الزمير.