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Fardin Khazaei[1], Majid AghaAlikhani[1], Samad Mobasser[2], Ali Mokhtassi-Bidgoli[1], Hesam Asharin[2], Hossein Sadeghi[2]

[1]Department of Agronomy, Faculty of Agriculture, Tarbiat Modares University, Tehran, Iran;
[2]Seed and Plant Certification and Registration Institute, Agricultural Research, Education and Extension Organization (AREEO), Karaj, Iran

EVALUATION OF WHEAT (*TRITICUM AESTIVUM*, L.) SEED QUALITY OF CERTIFIED SEED AND FARM- SAVED SEED IN THREE PROVINCES OF IRAN

ABSTRACT

The objective of this study was to study the seed quality aspects of wheat (*Triticum aestivum* L.) and the extent of weed seed contamination present in wheat seeds produced in different regions of Iran. Four districts (cities), each including 12 fields (six certified seed fields and six farm-saved seed fields), were selected in each regions (provinces). One kilogram of the wheat seed sample was collected from each field for analysis in the laboratory. Wheat seeding was commonly done by farm-saved seed sourced from within the farm due to the high costs of certified seeds purchased from outside sources, followed by the low seed quality. The use of a farm-saved seed resulted in a higher germination rate and a lower mean time to germination compared with another system. The more positive temperatures experienced by mother plants could decrease the number of normal seedling and seedling length vigor index. Generally there was virtually no difference about physiological quality between certified seed and farm- saved seed sector that is related to lower quality of certified seed. The certified produced seeds had the lower number of weed seed, species and genus before and after cleaning. The highest seed purity and 1000 seed weight was obtained from the certified seed production system. The need for cleaning the farm-saved seed samples before sowing is one of the important findings of this survey.

Keywords: germination indices; seed production system; vigor; weed seed dispersal; winnowing

INTRODUCTION

Importance of wheat (*Triticum aestivum* L.) as an agricultural crop is punctuated by the fact that it ranks second after maize in the world cereal output and it is a staple food for billions of people of the world. It is also the most important winter cereal

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grown in Iran (Zand *et al.* 2007). A little more than 9 million ha of arable land in Iran are planted with cereals, of which wheat occupies 6.6 million ha. To grow this plant, 80-85% of the national seed requirements of the country are derived from farm-saved seeds, so a substantial investment has been made in agricultural research to evaluate the wheat farm-saved seed performance (Mobasser *et al.* 2012).

More than 80% of the crops in developing countries are planted from seed stocks of the farmers (Almekinders and Louwaars 1999). According to the crop, the share of the certified seed system in supplying the country's seed requirement varies. For some hybrid seeds, 100% of the needed seed are produced by state companies, while for self pollinated crops as cereals, the share of certified system is estimated lower than 20% (Mobasser *et al.* 2012).

Since seed quality is a critical and basic input that affects crop production potential, it should reach farmers in a good quality state. Seed quality is composed of many aspects where four key attributes as genetic, physical, physiological and health quality are clearly identified. However, seed quality can be influenced by environmental conditions and also the cultural practices used for production. Preserving seed quality is fundamental if the variety meet the expectation of farmers and consumers (van Gastel *et al.* 2002). Seed quality within farmer seed systems is controlled by social norms of reciprocity, whereas in the certified sector seed schemes, seed is produced commercially; without seed regulation, the onus is on the procedure (i.e. the project) to maintain quality standards (Jones *et al.* 2002).

Dispersal and spread of weed seeds is an important biological factor affecting seed quality control and an essential element when considering crop weed management strategies (Michael *et al.* 2010). Previous studies have identified high levels of weed seed contamination in crop seed in Australia (Michael *et al.* 2010) and Ethiopia and Syria (Bishaw 2004). In addition, Bishaw (2004) reported that the average physical purity of wheat seed samples collected from different districts of Ethiopia was 98.92% and also there were significant differences in physical purity between different wheat growing regions in Ethiopia.

Considering seed quality, the first and the most important step in reducing weed infestation is the use of clean seeds (Michael *et al.* 2010; Chauhan 2013). Weeds can cause significant reductions in both productivity and seed quality of desirable species such as wheat (Mokhtassi-Bidgoli *et al.* 2013b). It has long been thought that many infestations of weed populations are a direct result of seeding with contaminated crop seed. Therefore, the objective of this study was to study the quality aspects of wheat seeds and the extent of weed seed contamination present in wheat seeds produced in different regions of Iran taking into account weather conditions, seed sources and agronomic practices.

MATERIALS AND METHODS

A total of 144 wheat farmers were interviewed in three wheat growing regions of Iran. Four districts (cities), each including 12 fields (six certified fields and six farm-saved seed fields), were selected in each regions (provinces) (Fig. 1). One primary sample for each 500 kg of 3001-20000 kg lot size and also one primary sample for each 700 kg of 20001 kg and above lot size were taken and samples were mixed and finally one kilogram of seed sample was prepared by the divider (ISTA hand book on seed sampling, 2004) from each field for analysis in the laboratory. All samples collected during the survey were used to determine the number of weed seed, genus and species before and after cleaning. Weed seeds were separated manually from the samples and their species and genera were identified. These weed seeds were returned to the samples. After that, the samples were cleaned using a Westrup LA-LS air/screen cleaner. The grain velocity used was 3.5 m/sec. The screen system is consisting of one sieve boat with 1 short scalping screen 275 × 275 mm and 2 long grading/-sand screens 275 × 540 mm which gives a total screen area of 0.34 m^2.

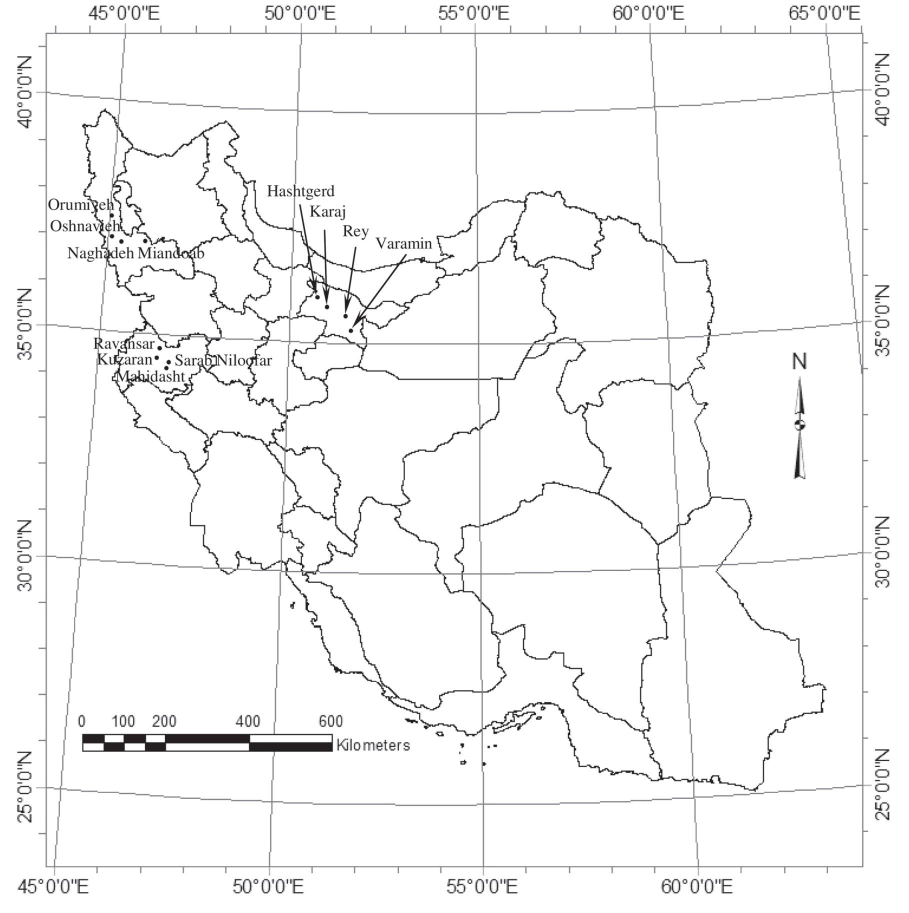

Fig. 1. Geographic distribution of wheat farms in studied areas

All samples were analyzed for seed quality (physical purity, thousand seed weight, germination, vigor, etc.). The tests were conducted at the seed testing laboratory of the Seed and Plant Certification and Registration Institute (SPCRI), Karaj, Iran in 2011-2012.

The meteorological data recorded during the study period in each growing season and geographical altitudes are given in Table 1.

Table 1

The averag0e annual maximum, minimum and mean temperatures (°C), annual total precipitation [mm] recorded in 2011-2012 and geographical altitudes (m) in studied areas.

Province	Cities	Maximum temperature	Minimum temperature	Mean temperature	Precipitation	Altitude
Tehran and Alborz	Karaj	22.4	1.3	10.6	174.1	1380
	Hashtgerd&Nazarabad	21.2	1.2	10.4	181.3	1191
	Varamin	19.9	6.7	13.3	148.0	918
	Rey	18.6	6.5	12.5	159.0	1060
Average		20.5	3.9	11.7	165.6	1137.2
Kermanshah	Sarab Niloofar	18.5	1.9	10.1	293.0	1331
	Mahidasht	18.8	2.0	10.4	344.2	1420
	Kuzaran	18.8	1.7	10.2	273.3	1368
	Ravansar	16.8	4.1	10.3	378.2	1362
Average		18.2	2.4	10.3	322.2	1370.2
West Azarbaijan	Orumiyeh	13.3	0.4	6.8	217.5	1328
	Oshnavieh	13.2	0.5	6.9	327.1	1415
	Naghadeh	13.9	2.3	8.0	214.0	1307
	Miandoab	14.7	1.9	8.2	192.0	1300
Average		13.8	1.3	7.5	237.7	1337.5

The farmers were asked to give information about their preferences and uses of seed sources and agronomic practices for wheat production (Tables 2, 3 and 4).

Seed quality attributes - physical

Other seeds by number analysis

According to ISTA rules (2012), the 1000g seed sample was evaluated for determination of the number of other seeds.

Physical (analytical) purity test

Two replicates of 60 g from each seed sample were analyzed. The samples were divided into four fractions (pure seed, other seed and inert matter). After analysis, the percentage of each fraction (based on weight) was calculated (ISTA 1996).

Thousand Seed Weight (TSW)

Two replicates of 1000 seeds were separated using a seed counter and then the mean seed weight was calculated (Bonner 1974).

Seed quality attributes - physiological

Germination Test

Four replicates of 100 seeds from each sample were planted in pleated paper. Then, seeds were placed in a germination room maintained at 20°C for 8 days for wheat according to ISTA Rules (ISTA 1996). The germination boxes were removed at the end of the incubation period and seedlings were evaluated (Bekendam and Grob 1979). Normal seedling, abnormal seedling, dormant and dead seeds were recorded and the average calculated based on the final count.

Vigor tests

Germination rate

Four replicates of 100 seeds were planted from each sample and kept at 20 ± 1°C for a maximum of 12 days in a germination room until no further germination took place. Normal seedlings were removed each day at predetermined size and time until all seeds that are capable to produce normal seedlings, germinated. An index was calculated by dividing the number of seedlings removed each day by the number of days in which they were removed (Maguire 1962).

First seedling count

The first count was made during the germination test, and the numbers of normal seedlings were recorded (fourth day after planting). The final count was made on the eighth day and total number of normal seedlings, number of abnormal seedling, fresh seed and dead seeds was recorded (Agarwal 1986).

Seedlings shoot and root length

The seedling shoot and root lengths were assessed after the final count. 40 normal seedlings were randomly selected from each sample and the shoot length was measured from the point of attachment to the cotyledon to the tip of the seedling. The root length was measured from the point of attachment to the cotyledon to the tip of the root. The average shoot or root length was calculated by dividing the total shoot or root lengths by the total number of normal seedlings measured (Fiala 1987).

Seedling dry weight

The seedling dry weight was measured after the final count. From each replicate, ten seedlings was selected randomly and were cut free from their cotyledons and placed in envelopes and dried in an oven at 80 ± 1°C for 24 hours. The dried seedlings were weighed and the average seedling dry weight was calculated.

Germination indices

The following indices were calculated: Mean time germination (*MTG*) was calculated as follows:

$$MTG = \frac{\sum n_i \times d_i}{\sum n}$$

where n_i is number of germinated seeds till ith day and d_i is number of days from start of experiment till ith counting and n is total germinated seeds. Mean daily germination (MDG) is contrast to day germination speed (time to need for germination a seed), MDG is ‘mean germination days’ and it is speed germination day index and was determined as follows:

$$MDG = \frac{FGP}{D}$$

where *FGP* is final germination percentage and *D* is number of days from start to end of the experiment. Seedling vigor index length (*SVIL*) was calculated as follows:

$$SVIL = LP \times nor$$

where *LP* is length of seedling and *nor* is number of normal seedlings. Seedling vigor index weight (*SVIW*) was calculated as follows:

$$SVIW = WDP \times nor$$

where *WDP* is total weight of seedlings and *nor* is number of normal seedlings (Ellis and Roberts 1981).

Statistical analyses

After initially testing the normal distribution of residuals, data were subjected to analysis of variance (ANOVA), using the GLM and Nested procedures of SAS (SAS Institute Inc. 2002) for a nested design. Nested analyses were conducted by nesting fields within seed production systems and seed production systems within districts (cities). The appropriate error term for province *F*-test was district (province). Differences between means were determined by Duncan's multiple range tests at the 0.05 probability levels.

RESULTS AND DISCUSSION

Natural precipitation, temperature and farmlands management

As Table 1 shows, temperature and natural precipitation varied among the cities. The annual total precipitation for provinces was in the declining order of Kermanshah > West Azarbaijan > Tehran and Alborz, while the average annual temperature followed the trend West Azarbaijan < Kermanshah < Tehran and Alborz.

In Iran, wheat seeding is commonly done by farmers saved seed seeds sourced from within the farm due to the high costs of certified seeds (40% more than farmers saved seed) purchased from outside sources, followed by the low seed quality (Table 2). A study by Michael *et al.* (2010) found that of the 16 not cleaned crop seed samples, nine were wheat and seven were an alternative crop (barley and lupin), with most samples sourced from within the farm (94%).

Table 2

The proportion (% based on farmer reports in studied areas) of reasons for not using the certified seeds

Province	Cities	Maximum temperature	Minimum temperature	Mean temperature	Precipitation	Altitude
Tehran and Alborz	Karaj	22.4	1.3	10.6	174.1	1380
	Hashtgerd&Nazarabad	21.2	1.2	10.4	181.3	1191
	Varamin	19.9	6.7	13.3	148.0	918
	Rey	18.6	6.5	12.5	159.0	1060
Average		20.5	3.9	11.7	165.6	1137.2

Three methods were used to treat the wheat seeds of farm-saved seed section after harvest (Table 3), with fungicide seed treatment (51%), followed by machine cleaning (22%), and then sieving (15%). Michael *et al.* (2010) reported the share of gravity table, rotary screen and sieves considered for the cleaning of crop seeds were 38%, 8% and 3%, respectively.

Most farmers rely on herbicides for weed management (Table 4). The level of weed control and price were the top two things that farmers considered when selecting herbicides.

Table 3

The proportion (%) of different post harvest activities on farm-saved seed in studied areas in 2011-12

Province	Sieving	Machine cleaning	Fungicide seed treatment	No action
Tehran and Alborz	6.2	16.7	60.4	16.7
Kermanshah	2.1	45.8	52.1	0.0
West Azarbaijan	35.4	4.2	39.6	20.9
Average	14.6	22.2	50.7	12.5

Table 4

The proportion (%) of types of weed control methods in wheat farmlands and seed production systems in areas studied in 2011-12.

Province	Hand weeding	Herbicide application	No control
Tehran and Alborz	4.2	82.3	13.5
Kermanshah	1.1	88.5	10.4
West Azarbaijan	0.0	93.8	6.3
Seed production system			
Informal	0.7	79.2	20.1
Formal	2.8	97.2	0.0
Average	1.8	88.2	10.1

Three main reasons of the farmers for not using of certified seed was related to the High price (45.8%), low seed quality (27.1%) and insufficient supply (14.6%).

Physiological quality

There were significant differences among provinces on normal seedling (P<0.05), dead seed (P<0.05), abnormal seed (P<0.01), seedling shoot length (P<0.05) and seedling root length (P<0.01), while the effect of seed production system was significant only for fresh seed (Table 5). Seedling length vigor index and both germination rate and mean time to germination were affected significantly by provinces and seed production systems, respectively (Table 5). The highest and lowest values of normal seed, seedling shoot length, seedling root length, abnormal seed and seedling length vigor index of wheat were related to West Azarbaijan and Kermanshah provinces, respectively, while the highest and lowest dead seed values were related to Tehran & Alborz and Kermanshah provinces, respectively (Table 5). Maximum and minimum fresh seed percentages were obtained from farm-saved seed and certified seed production systems, respectively (Table 5). The use of a farm-saved seed production system resulted in a higher germination rate and a lower mean time to germination compared with certified seed system (Table 5). The reason of these finding might is related to incorrect management at the nucleolus seed production by the formal institutions.

Table 5a

Physiological quality (vigour) of wheat seed collected from certified seed and farm-saved seed sources in 2011-2012. Summary of *F* significance from analysis of variance (ANOVA) of experimental factors

Provinces	Normal seedling [%]	Abnormal seedling [%]	Ungerminated seeds: Dead seed [%]	Ungerminated seeds: Fresh seed [%]	Seedling shoot length [cm]	Hypocotyl length [cm]	Seedling root length [cm]	Seedling fresh weight [cm]
Tehran and Alborz	95.8125ab	2.0208 b	1.6667a	0.9167a	21.6998b	11.3738a	10.3265b	1.1940a
Kermanshah	95.0417b	3.7500a	0.4792b	1.0833a	21.4017b	11.7840a	9.6194b	1.3638a
West Azar-baijan	97.0625 a	1.7708b	0.8333ab	0.7708a	22.8085a	11.1667a	11.6463a	1.0456a
Seed production system								
Farm-saved seed	95.7917a	2.4583a	0.9444a	1.1250a	21.9040a	11.3461a	10.5589 a	1.0092a
Certified seed	96.1528a	2.5694a	1.0417a	0.7222b	22.0360a	11.5368a	10.5025 a	1.3931a
Source								
Provinces	*	**	*	ns	*	ns	**	ns
Cities	ns	ns	*	ns	ns	ns	ns	ns
Seed sys-tems	ns	ns	ns	**	ns	ns	ns	ns

Table 5b

Physiological quality (vigour) of wheat seed collected from certified seed and farm-saved seed sources in 2011-2012. Summary of *F* significance from analysis of variance (ANOVA) of experimental factors

Provinces	Seedling dry weight [g]	Final germi-nation [%]	Germination rate	Mean daily germination [number/day]	Mean time to germination [day]	Seedling length vigor index	Seedling weight vigor index
Tehran and Alborz	0.166042a	97.8333a	61.466a	39.181a	1.75292a	2077.45b	15.8327a
Kermanshah	0.162708a	98.6458a	61.485a	42.124a	1.75729a	2031.63b	15.3531a
West Azarbai-jan	0.169375a	98.6458a	59.578a	40.754a	1.79771a	2211.51a	16.3171a
Seed production system							
Farm-saved seed	0.160139a	98.1389a	61.898a	40.7665a	1.74556 b	2097.23a	15.2331a
Certified seed	0.171944a	98.6111a	59.788b	40.6060a	1.79306 a	2116.50a	16.4356a
Source							
Provinces	ns	ns	ns	ns	ns	**	ns
Cities	ns	ns	ns	*	ns	ns	ns
Seed systems	ns	ns	**	ns	**	ns	ns

Means within a column and study factor followed by the same letter are not significantly different according to Duncan's multiple range test at the 0.05 probability level of significance; n.s., * and ** are non significant, significant at the 0.05 and 0.01 probability levels, respectively.

These findings are in contrast with those of Kshetri (2010) who observed the highest levels in seed quality attributes such as germination, 1000 seed weight genetic purity percentage in certified seed. It was noticed that farmers who used own saved seeds produced seeds with less germination percentage compared to farmers who used certified seeds.

Both biotic and abiotic conditions experienced by mother-plants during the formation, development and maturation of seed affect the phenotype of the off-spring. In the present study, the average annual temperature was significantly correlated with normal seed (r=-0.66, P<0.05), seedling shoot length (r=0.66, P<0.05), seedling root length (r=-0.74, P<0.01) and seedling length vigor index (r=-0.65, P<0.05). As can be seen, the more positive temperatures experienced by mother plants can decrease the number of normal seed and seedling length vigor index. In fact, high temperature combined with drought and high winds in the maternal environment may negatively affected plants, especially during the heading, flowering and grain filling stages. The results of Sales *et al.* (2013) have indicated that stressful environmental conditions experienced by mother plants may act as cues signalizing unfavorable conditions for seed germination.

Generally there was virtually no difference about physiological quality between certified seed and farm- saved seed sector (just small number of traits were statistically different) that is might related to reduction of financial support of the government and incorrect management in formal seed production system.

Weed seed contamination before and after cleaning

The number of weed seed, genus and species in wheat before and after cleaning was affected significantly by seed production system (P<0.01). In addition, significant differences for the number of weed genus and species in wheat after cleaning were observed between provinces (P<0.05) (Table 6). The maximum and minimum number of weed seed, genus and species before and after cleaning were related to farm-saved seed and certified seed production systems, respectively (Table 6). The highest and lowest number of weed genus and species after cleaning was related to Kermanshah and Tehran and Alborz provinces, respectively (Table 6). These results are in line with those of Bishaw (2004) who reported highly significant differences in seed quality for seed samples collected from different regions and seed systems for wheat and barley crops in Syria and Ethiopia in a way that certified seeds showed better conditions.

As above mentioned, the number of other crop seed and other distinguishable variety were significantly lower in certified seed than that of seed produced by farm-saved seed production system. In certified seed production, farmers removed the off-types and all other crop plants during rouging due to compulsion of seed certification. So, it is necessary to suggest to farmers to adopt proper practice in additional management as in certified seed production for maintaining the physical and genetic purity of seed. As it is indicated in Table 4, certified seed farmers have applied more weed control compared to farm-saved seed farmers and this can be one of the reasons for lower rate of weed seeds in certified seed samples than farm-saved seed. The certified seeds had the lower number of weed seed, species and genus by 50%, 8% and 8% before cleaning and by 17%, 45% and 45% after cleaning, respectively, compared with the produced seeds of the farm-saved seed section (Table 6). Furthermore, cleaned seeds had significantly the lower number of weed seed, genus and species by 91%, 25% and 74% for certified seeds and by 97%, 83% and 83% for farm-saved seeds, respectively, than uncleaned indicting the importance of employing crop cleaning techniques.

Table 6

The number of weed seed, genus and species within wheat seed before and after cleaning in provinces and seed production systems tested in 2011-12. Summary of *F* significance from analysis of variance (ANOVA) of experimental factors

Provinces	The number of weed					
	Seed	Genus	Species	Seed	Genus	Species
	Before cleaning			After cleaning		
Tehran and Alborz	385.3a	7.73b	8.67a	28.13a	1.44b	1.56b
Kermanshah	413.5a	10.15ab	11.54a	32.06a	3.00a	3.56a
West Azarbaijan	445.3a	11.63a	13.17a	26.00a	1.96ab	2.23ab
Seed production system						
Farm-saved seed	552.8a	10.82a	12.24a	49.24a	2.75a	3.17a
Certified seed	276.7b	8.85b	10.01b	8.22b	1.51b	1.74b
Source						
Provinces	ns	ns	ns	ns	*	*
Cities	ns	ns	ns	ns	ns	ns
Seed systems	**	**	**	**	**	**

Means within a column and study factor followed by the same letter are not significantly different according to Duncan's multiple range test at the 0.05 probability level of significance; n.s., * and ** are nonsignificant, significant at the 0.05 and 0.01 probability levels, respectively.

As it can be seen, cleaned seeds had some level of weed seed contamination. Michael *et al.* (2010) found that it is impossible to completely remove all foreign weeds seeds from grain due to high costs and the purchase of certified seed does not guarantee weed seed–free status. On the other hand, the differences among the provinces regarding to seed (species) purity, and the lower rate of weed seed contamination in certified seed might be related to origin of the seed source, agricultural practices, and field's inspection by inspectors. There were negative significant correlations for the number of weed genus and species before and after cleaning vs. planted area and vs. nitrogen application (data not shown).

As may be expected, the presence of more N may promote higher crop growth rates and plant spacing will be low enough to permit additional weed plants per area unit (Mokhtassi-Bidgoli *et al.* 2013a). It seems that the larger the area under cultivation, the higher the economic return, the greater the power of the farmer and consequently the greater the control of the weed.

Analytical purity and seed loss during cleaning

There were significant differences between different seed sources for analytical purity (Table 7). The highest seed purity and 1000 seed weight was obtained from the certified seed production system (Table 7). This finding is in line with those of Hasan (1995) who reported significantly higher purity values for wheat certified seed compared to farm-saved seed source except in other crop seed contamination. Also this result is in contrast with Ensermu *et al.* (1998) that reported no significant difference for analytical purity and other crop seeds contamination of seed samples collected from different sources of wheat in Ethiopia.

Table 7

The values of seed loss weight after cleaning, seed purity and 1000 seed weight in provinces and seed production systems tested in 2011-12. Summary of *F* significance from analysis of variance (ANOVA) of experimental factors

Provinces	Seed loss weight after cleaning [g]	Seed purity [%]	Weed seed [%]	Inert matter [%]	1000 seed weight [g]
Tehran and Alborz	157.86a	99.43a	0.16a	0.41a	44.30a
Kermanshah	133.33ab	99.41a	0.10a	0.50a	43.16a
West Azarbaijan	108.00b	99.51a	0.10a	0.39a	41.47a
Seed production system					
Farm-saved seed	148.87a	99.34b	0.21a	0.45a	41.74b
Certified seed	117.26b	99.56a	0.03b	0.41a	44.22a
Source					
Provinces	ns	ns	ns	ns	ns
Cities	ns	ns	ns	*	ns
Seed systems	**	*	**	ns	**

Means within a column and study factor followed by the same letter are not significantly different according to Duncan's multiple range test at the 0.05 probability level of significance; n.s., * and ** are nonsignificant, significant at the 0.05 and 0.01 probability levels, respectively.

Based on the results the highest seed loss after cleaning was related to Tehran and Alborz province and farmers saved seed section (Table 7).

Since all of the produced seeds by the farmers are not supposed to be planted for the next season and just some part of the seed (about 250 kg × h^{-1}) is needed for planting and also as we find the seed loss during the cleaning in farm-saved seed is about 15% (37.5kg) and furthermore the price of 1kg of certified seed is about 50% more than farmers saved seed. So providing the certified seed for farmers of farm-saved seed is not economical. Also in the other side as we find the certified seed did not have enough quality and if the problems in this section don’t be solved, we don't recommend the farmers use certified seed and its better the farmers in the farm-saved seed sector clean the needed seed for planting in the next season that can be considered as important outcome of the research.

Detected weed seed species

Based on the results, 24 families included 73 weed genus and 124 weed species were detected in studied areas. The highest and lowest weed diversity was related to dicotyledonous (97) and monocotyledonous (27) respectively. About 90% of weed species were C3 plants (included 18 monocotyledonous and 93 dicotyledonous) and just 10% of weed species were C4 (included 9 monocotyledonous and 4 dicotyledonous). Annual (80 species), perennial (38) and biennial (6) weed had the highest diversity in respect of life cycle, respectively.

Generally, the highest variation of weed species was related to *Poacea* (24) and *Fabaceae* (18) families, while the lowest weed species was included *Dipsacaceae*, *Euphorbiaceae*, *Primulaceae*, *Resedaceae* and *Scrophulariaceae (*Table 8*)*. The same results were reported by Norozzadeh *et al* (2008) and Koocheki *et al.* (2006).

Table 8

Weeds family detected and its number in studied traits

Family	Number	Family	Number
Poacea	24	*Malvaceae*	3
Fabaceae	18	*Liliaceae*	3
Brassicaceae	11	*Rubiaceae*	3
Polygonaceae	10	*Lamiaceae*	2
Apiaceae	6	*Plantaginaceae*	2
Asteraceae	6	*Ranunculaceae*	2
Boraginaceae	6	*Rosaceae*	2
Caryophillaceae	6	*Dipsacaceae*	1
Chenopodiaceae	5	*Euphorbiaceae*	1
Amaranthaceae	4	*Primulaceae*	1
Convolvulaceae	3	*Resedaceae*	1
Cuscutaceae	3	*Scrophulariaceae*	1

Koocheki *et al.* (2006) by Assessing species and functional diversity and community structure for weeds in wheat and sugar beet in Iran, reported that the total number of weed species were 72 and 52 species in wheat and sugar beet, respectively. Also he showed the *Poaceae* and *Asteraceae* had the most diverse amongst monocotyledonous and dicotyledonous groups in the wheat fields while *Poaceae* and *Brassicaceae* were the most diverse family amongst monocotyledonous and dicotyledonous groups in the sugar beet fields.

Norozzadeh *et al.* (2008) by evaluation of species, functional and structural diversity of weeds in wheat fields of three provinces in Iran showed that the weeds of wheat fields were belong to 26 families and 120 species. The majority of weed species were of Asteraceae (20 species) and Poaceae (25 species) amongst dicotyledonous and monocotyledonous, respectively.

In another research, Poggio *et al.* (2004) by evaluation of Structure of weed communities occurring in pea and wheat crops in the Rolling Pampa of Argentina reported that the weed community in pea was more diverse than wheat field. 12 weed species included *Polygonum aviculare, Lolium perenne, Convolvulus arvensis, Secale cereale, Hordeum vulgare, Chenopodium album, Conringia orientalis, Galium tricornatum, Avena fatua, Convolvulus sepium, Sorghum halepense* and *Panicum miliaceum* which were more diverse than the others in the studied areas and seed production systems were analyzed.

Lolium perenne, Convolvulus arvensis, Secale cereale, Chenopodium album, Conringia orientalis, and *Galium tricornatum* were affected significantly by the provinces (Table 9).

Table 9a

Effect of provinces and seed production systems on weed seed number. Summary of *F* significance from analysis of variance (ANOVA) of experimental factors

Source	*Polygonum aviculare*	*Lolium perenne*	*Convolvulus arvensis*	*Secale cereale*	*Hordeum vulgare*	*Chenopodium album*
			Provinces			
Tehran and Alborz	93.44	123.32	7.25	0.33	37.73	42.04
Kermanshah	182.84	0.04	38.31	0.00	11.90	5.73
West Azarbaijan	82.04	0.77	75.92	66.48	16.94	10.25
F test	ns	*	**	*	ns	*
			Seed production system			
Farm-saved seed	165.63	52.53	40.71	44.46	33.43	25.43
Certified seed	72.97	30.22	40.28	0.08	10.94	13.25
F test	ns	ns	ns	ns	*	ns

Means within a column and study factor followed by the same letter are not significantly different according to Duncan's multiple range test at the 0.05 probability level of significance; n.s., * and ** are non significant, significant at the 0.05 and 0.01 probability levels, respectively.

Table 9b

Effect of provinces and seed production systems on weed seed number. Summary of *F* significance from analysis of variance (ANOVA) of experimental factors

Source	*Conringia orientalis*	*Galium tricornatum*	*Avena fatua*	*Convolvulus sepium*	*Sorghum halepense*	*Panicum miliaceum*
			Provinces			
Tehran and Alborz	0.00	0.00	0.79	3.00	5.25	10.92
Kermanshah	44.43	33.44	8.27	5.56	6.65	5.25
West Azarbaijan	4.67	1.75	22.40	22.13	14.44	9.31
F test	**	**	ns	ns	ns	ns
			Seed production system			
Farm- saved seed	25.28	21.03	18.60	15.49	12.03	10.56
Certified seed	6.79	2.43	2.38	4.97	5.71	6.43
F test	*	*	*	ns	ns	ns

Means within a column and study factor followed by the same letter are not significantly different according to Duncan's multiple range test at the 0.05 probability level of significance; n.s., * and ** are non significant, significant at the 0.05 and 0.01 probability levels, respectively.

While just *Conringia orientalis*, *Galium tricornatum* and *Hordeum vulgare* were affected significantly by the seed systems.

Furthermore some weed species as *Hordeum spontaneum, Hordeum disticum, Secale cereal, Avenea fatua, Avenea luduviciana, Acroptilon repens, Glycegrrhiza glabra, Vicia Villosa, Lathyrus sativus, Malva neglecta, Convolvulus arvensis, Turgenia latifolia and Lisaea heterocarpa* that are considered as noxious weed were removed very few through cleaning (data no Shown).

Difference in hand weeding, fertilizer and fungicide application management, the crop rotation and also weed seed bank of the soil might are the reason for difference the weed seed in provinces and seed systems.

CONCLUSIONS

Generally there was virtually no difference about physiological quality between certified seed and farm- saved seed sector that is related to lower quality of certified seed. This issue might occurred through more reduction of financial support of the government and also incorrect management of formal seed production sector and consequently reduction of seed quality in the breeder seed, foundation seed and finally certified seed systems.

Since some part of the produced seed (about 250 kg × ha^{-1}) is needed for planting and also as we find the seed loss during the cleaning in farmers saved seed is about 15% (37.5kg) and furthermore the price of 1kg of certified seed is about 50% more than farmers saved seed. So providing the certified seed for farm-saved seed farmers is not economical. Also in the other side as we observed, the certified seed in studied areas did not have enough quality and if the problems in this section don't be solved, it is recommend the farmers don't use certified seed and its better the farmers in the farmers saved seed sector clean the needed seed for planting in the next season.

Also it was recognized, the cleaning is an inevitable practice, which should be conducted to reduce weeds in seed samples especially for farmers saved seed samples that are supposed to be planted for the next season. Prevention is the most important method of dealing with weeds. Once a weed has entered an area and become established, eradication is far more expensive and it is likely that greater resources will be required to control its further spread and decrease its impact. So, the first step in weed prevention is considered as preventing the entry of weeds into fields. It is also necessary to organize the Seed Quality Management training program effectively in farmer conditions for strengthening farmer seed system in the country. The need for cleaning the farmers saved seed samples before sowing is one of the important findings of this survey. Thereby, removing a large quantity of weeds and other crop seeds from the main sample will result in more purity in harvested seeds, less herbicide application, less soil and water contamination, more yield and production of healthy food. it is suggested that not only the same study in another parts of the country but also in another countries be conducted to get more information about the seed systems and making the strategies for improvement the seed systems based on the results.

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