

## Possibilities of High Quality Seed Production of Food Legumes in Turkey

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Received: 01.07.2015 Accepted: 26.08.2015

### Key words:

Food legume, production, quality seed

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**Abstract.** In recent year, the sowing area and export of grain legumes have been decreasing in Turkey. However, Turkey is one of the most important producer in terms of chickpea and lentil production in the world, but in Turkey, generally use of certified seed of grain legumes by farmer is low. They have not got custom of using variety and certified seed is rather expensive. Legume crops are self pollinated. Therefore, the farmers are using the seeds that they produce on their own. Both public sectors and private seed companies produce the certified grain legume seeds, but in Turkey seed production is too few to provide the requirement of grain legume seeds. Control of seed quality in seed production must conform to statutes of National Certification Standart. These are varietal purity, good germination, good seedling vigor, free from disease infections, free from weed seed, right moisture percentage, good level of physical purity, good maturity period and uniform seed.

## Türkiye’de Yemeklik Tane Baklagillerin Yüksek Kaliteli Tohumluk Üretim Olanakları

### Anahtar kelimeler:

Yemeklik Tane Baklagiller, Verim, Tohumluk Kalitesi

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**Özet.** Türkiye’de son yıllarda yemeklik tane baklagillerin ekim alanları ve ihracatı giderek azalmaktadır. Bununla birlikte, Türkiye, mercimek ve nohut bakımından Dünyada önde gelen üretici ülkeler arasındadır. Ancak, Türkiye’de çiftçiler tarafından genellikle sertifikalı tohum kullanımı azdır. Sertifikalı tohumun pahalı olma sebebiyle çeşit kullanma alışkanlığı yoktur. Baklagiller kendine döllenmesi nedeniyle, üreticiler kendi ürünlerini tohumluk olarak kullanmaktadır. Türkiye’de kamu ve özel sektör yemeklik tane baklagillerin sertifikalı tohumluğunu üretmekle birlikte, üretilen tohumluk miktarı tohumluk gereksiniminin çok azını karşılayabilmektedir. Kaliteli tohumluk üretimi Ulusal Sertifikasyon Standartlarına uygun olmalıdır. Kaliteli tohumluk üretiminde iyi çimlenme, çeşit saflığı, fide çıkış gücü, tohum hastalıklardan ve yabancı ot tohumlarından arındırılmış, nem içeriği, fiziksel saflık düzeyi, uygun olgunlaşma dönemi ve standart irilikte gibi özellikler dikkate alınmalıdır.

## 1. GİRİŞ

In recent years, the sowing area and export of grain legumes have been decreasing in Turkey. In Turkey sowing area and production of grain legumes is 806.000 ha and 1.147.000 ton respectively (TÜİK 2014). However, Turkey in terms of chickpeas and lentils is among the most important producers countries in the world (Özer *et al.*, 2010; Baloch *et al.*, 2015a). New developed cultivars and their quality seed used by farmer have provided the yield increase recently (Öziç 2014).

Profitability in production of the grain legumes is low, because of the fact that the use of certified seeds and growing techniques applied by farmer are deficient. Seed production of certified grain legume has changed year after year due to sowing area. In Turkey, there are many varieties of chickpea, lentil and dry bean with high yield potential, resistant to disease, early maturing, favourable to harvesting with machine. However, farmers haven't got custom of using variety Furthermore, production of certified seed is insufficient and the farmers find seed expensive. Legume crops are self-pollinated. Therefore, the farmers use the seeds that they produce on their own. Yield and quality of seed decrease because of some farmers using mixed seed provided from different sources. Public sectors and private seed companies produce the certified grain legume seed, but yet seed production in Turkey is too low to meet the needs of grain legume seeds.

## 2. CERTIFIED SEED PRODUCTION OF GRAIN LEGUME IN TURKEY

Seeds are the part of a plant and also the most important input in crop production as %50 gain in productivity (Utoh and Ajeigbe 2008). In Turkey, certified seed production values of some major food legumes are given on the Tables 1, 2 and 3. As seen from the mentioned tables, in Turkey, seed production and demand/supply rate for seed have varied year after year due to changing sowing area.

In recent years, seed production of lens has increased more than other legume crops, but it is not enough to meet certified seed requirement.

The amount of dry bean seed production is very lower than chickpea and lens. Certified seed of faba bean, pea and cowpea have not been

produced because of the fact that their cultivation is not widespread (Baloch *et al.*, 2015b). The mentioned grain legumes are self pollinated crops so the farmers commonly use their own seed. It is recommended to repurchase seed of the variety every 3 years. In recent years, new grain legume cultivars have developed and their seeds have been produced by private and mostly public sector. Support for use of certified seed has been carried out in Turkey in recent years. So, use of certified seed has increased compared to previous years.

## 3. QUALITY FACTORS IN SEED PRODUCTION

The control of seed quality in seed production must conform to statute of National Certification Standart. The factors affecting the seed quality are varietal purity, good germination, good seedling vigor, free from disease infections, free from weed seed, right moisture percentage, good level of physical purity, good maturity period and uniform seed.

Factors affecting the quality in seed production are explained below.

Seed vigor is affected by many factors. These are mechanical damage, environment and nutrition of the mother plant, seed size, stage of maturity at harvest and drying temperature. Generally good germination is belived to be related with good seedling vigor (Bishaw and Gastel 1996).

Physical purity is important for germination and good crop stand. Grain legume seed should not contain seed of different crop, weeds, species or such as matter straw, stone and soil. Physical purity is determined by laboratory controls in the samples taking from seed.

Varietal purity is very important in term of seed quality. It is indicate genetically pure of variety. Varietal purity can be determined by examining seed in the laboratory or producing in seed fields.

#### 4. TECHNIQUES OF GRAIN LEGUME SEED PRODUCTION

Techniques of seed production are explained below.

##### 4.1. Selection of seed production region

In Turkey, there are good ecological conditions to increase seed production of grain legumes. For food legumes, the best soil is a well-drained, sandy loam to clay loam soil with pH 6 and 7. High temperature and precipitation occurring in the duration of blooming decrease the seed yield. The optimum temperature is 20-25 °C at blooming and pod stage for good pollination and fertility. Bean should be

grown in the fertile soil while chickpea and lentil should be grown in medium fertile soils for good seed performance.

Lentil is produced in Southern and Central Anatolia of Turkey. Chickpea can be grown in all areas of Turkey. In coastal region, yield capacity of chickpea sown in fall is high, but one of the major problems is *Ascochyta* blight damage which is seen in winter chickpea production in coastal region especially with precipitation especially.

Dry bean is usually produced in Central and Eastern Anatolia, but erect type maturing at the same time should be grown in this region.

**Table 1.** Chickpea seed production values and need for seed in Turkey.

Çizelge 1. Türkiye’de nohut tohumluk ihtiyacı ve üretim değerleri.

Yıllar	Planting area* (ha)	Seed production** (ton)	Estimated seed*** requirement (ton)	Demand/supply rate for seed (%)
2009	455.934	459	15.197	3.0
2010	455.690	253	15.189	1.6
2011	446.412	309	14.880	2.0
2012	416.412	1239	13.874	8.9
2013	423.557	1603	14.118	11.3

\*TÜİK 2014, \*\*Bitkisel üretim istatistikleri Gn Md., 2014, \*\*Assuming that the producer will repurchase fresh seeds of the variety every 3 years and that the amount of seed is 10 kg per da.

**Table 2.** Lens production values and need for seed in Turkey.

Çizelge 2. Türkiye’de mercimek tohumluk ihtiyacı ve üretim değerleri.

Yıllar	Planting area* (ha)	Seed production** (ton)	Estimated seed*** requirement (ton)	Demand/supply rate for seed (%)
2009	214.931	38	7.164	0.5
2010	234.492	107	7.816	1.3
2011	214.846	589	7.161	8.2
2012	237.477	894	7.915	11.2
2013	281.178	2078	9.372	22.1

\*TÜİK 2014, \*\*Bitkisel üretim istatistikleri Gn Md., 2014, \*\*Assuming that the producer will repurchase fresh seeds of the variety every 3 years and that the amount of seed is 10 kg per da.

**Table 3.** Dry bean production values and need for seed in Turkey.

Çizelge 3. Türkiye’de kuru fasulye tohumluk ihtiyacı ve üretim değerleri.

Yıllar	Planting area* (ha)	Seed production** (ton)	Estimated seed*** requirement (ton)	Demand/supply rate for seed (%)
2009	94.928	3	3.164	0.09
2010	103.381	-	3.446	-
2011	94.625	-	3.154	-
2012	93.174	62	3.105	1.9
2013	84.763	54	2.825	1.9

\*TÜİK 2014, \*\*Bitkisel üretim istatistikleri Gn Md., 2014, \*\*Assuming that the producer will repurchase fresh seeds of the variety every 3 years and that the amount of seed is 10 kg per da.

## 4.2. Variety

In Turkey, many cultivars of chickpea, lens and bean have been developed with tolerance to the diseases. Also, these cultivars have also good grain performance and they are convenient to harvesting machine, but, seed production of few cultivar have been made. However, in coastal region of Turkey, seed production of winter chickpea varieties developed as tolerated to *Asoschyta rabei* can be made. On the other hand in Central and Southern region of Turkey winter lens seed should be produced (Toklu *et al.*, 2009, Karaköy *et al.*, 2012). Dwarf bean type seeds should be produced in the Central Anatolia.

## 4.3. Cultural practices

The land selected for seed production should not have been sown with same legume crop in the previous year. High yields and good quality seeds are obtained under good management. Seed bed preparation, seeding, weed and disease control, fertilizer, irrigation for grain legume seed production are the same as edible grain production.

Generally, row spacing of grain legume such as chickpea and field bean and faba bean for seed production vary from 50 to 70 cm, but lentil is planted in 15-17 cm row (Mc.Donald and Coopeland 1997). Seeding rate changes from variety to variety, depending on seed size. It is 6-12 kg da<sup>-1</sup> for dwarf bean, 5-15 kg da<sup>-1</sup> for lentil and 7-16 kg da<sup>-1</sup> for chickpea (Şehirli 1988., Gaur *et al.*, 2010, Baloch *et al.*, 2014).

Some diseases, such as *Asoschyta* blight and *Fusarium* wilt are transmitted by seed. For these reason, seed should be treatment with fungicides before planting. In the seed field weed control is too

important. Pree-emergence or post-emergece herbicides or cultural and by mechanical methods should be used before planting to control the weeds.

Field inspection is one of the important activities in seed production. Off-type plants such as different leaf types, different flower clours, different maturity periods and diseased plants should be discarded (Haddad 1996).

## 4.4. Harvesting

Seed crop should be harvested with combine machine to decrease yield losses and to prevent injury in seed. Otherwise, losses of seed and production cost increase. Legumes at the physiological maturity include moisture of 45-50% (Bishaw and Gastel 1996). The moisture content of seed should be 18-20% for good harvesting with machine (Şehirli 1988).

## 4.5. Drying and storage

The seed crops should be dried at a recommended temperature. Seed crop injury occurs under too high or low temperature and as a result seed vigor reduces. Moisture content of seed crop should be under 14% before storage (Sule and Ojo 2008). Seed crop must be dried at 40 °C during the short time if the seed moisture content is between 15-30%. The seeds should be stored in optimum temperature and moisture conditions for the prevention of disease and protection of seed value. Seed crop should not be stored above temperature of 10 °C and moisture of 65% for along time (Şehirli 1988).

**Table 4.** Laboratory Standart of Some Important Food Legumes in Turkey.

Çizelge 4. Türkiye'de bazı önemli yemeklik tane baklagillerin laboratuvar standartları.

Species	Germination (at least %)	Pure seed (at least%)	Inert matter (maximum%)	Other species and varieties (maximum number/kg)		Total weed seed rates (maximum number/kg)
				Certified seed I	Certified seed II-III	
				Chickpea, Bean and Cowpea	85	
Lens	85	97	3	10	15	0

Tohumluk Tescil ve Sertifikasyon Müdürlüğü, (2008).

#### 4.6. Isolation distance

Isolation distance is very important to obtain pure variety. So, the different varieties of the same species must be sown at certain distance to prevent contamination among varieties. Isolation distance for certified seed production must be 2 m for self-pollinated legumes such as chickpea, bean and lentil, but it is 200 m for faba bean because of cross-pollination (Tohum Tescil ve Sertifikasyon Gn. Md., 2008, Karaköy *et al.*, 2013).

### 5. CERTIFICATION

The different varieties of same species should not be planted before 1 year for bean and cowpea, 2 years for chickpea and lentil on the same field to prevent contamination from the previous crop. The seed fields should be cleansed from the weed through manually or using suitable herbicides. Also, seed crop should be free from insects and diseases. Fields are checked at the beginning of bloom or pod stage and 1 week before harvesting seed crop. Also, seed fields should be cleansed from different varieties and other crops. In the seed samples taken from cleaned seed crop for laboratory analysis are determined physical and varietal purity, percentage of germination.

### 6. CONCLUSION

The production and using certified seed of grain legumes are not widespread in Turkey. Grain legume crops are self-pollinated crops. So the farmers commonly use their own seed, but some farmers use non certified or imported seeds. The farmers should be informed about the importance of using certified grain legumes seed, and they should be encouraged. The farmers should provide cheaper seed and through an easier way. In Turkey, generally public agriculture organizations produce grain legume seeds, but it is not enough. So grain legume seeds produced by private seed companies should be increased more than nowadays. High-quality seed crop must be produced taking seed production rules in to account.

### REFERENCES

Baloch FS., Derya M., Andeden EE., Alsaleh A., Comertpay G., Kilian B and Özkan H., 2015. Inter-primer binding site retrotransposon and inter-

simple sequence repeat diversity among wild Lens species. *Biochemical Systematics and Ecology*, 58: 162-168.

Baloch FS., Karaköy T., Demirbaş A., Toklu F., Ozkan H and Hatipoğlu R., 2014. Variation of some seed mineral contents in open pollinated faba bean (*Vicia faba* L.) landraces from Turkey. *Turkish Journal of Agriculture and Forestry*, 38: 591-602.

Baloch FS., Alsaleh A., Sáenz de Miera LE., Hatipoğlu R., Çiftçi V., Karaköy T., Yıkıldız M and Özkan H., 2015. DNA based iPBS-retrotransposon markers for investigating the population structure of pea (*Pisum sativum*) germplasm from Turkey. *Biochemical Systematics and Ecology*, 61: 244-252.

Bishaw Z and Van Gestel AJG., 1996. Components of seed quality. *Seed Science and Technology* (Eds: AJG. Van Gestel., MA. Pagnotta and E. Porceddu), pp. 289-297, Syria.

Bitkisel Üretim İstatistikleri Genel Müdürlüğü 2014. Tohumculuk istatistikleri. Gıda Tarım ve Hayvancılık Bakanlığı, www.tarim.gov.tr [Erişim: 12 Ocak 2015].

Gaur PM., Tripathi S., Gowda CLL., Rango GV., Sharma HC., Pande S and Sharma M., 2010. Chickpea Seed Manual, Crops Research Institute for the Semi-arid Tropics (Icrisat). pp. 22.

Haddad NL., 1996. Seed production of grain legume. *Seed Science and Technology* (Eds: AJG. Van Gestel., MA. Pagnotta., E. Porceddu), pp. 195-200, Syria.

Karaköy T., Erdem H., Baloch FS., Toklu F., Eker S., Kilian B and Ozkan H., 2012. Diversity of macro- and micronutrients in the seeds of lentil landraces. *The Scientific World Journal*, 2012. 1-9.

Karaköy T., Baloch FS., Toklu F and Ozkan H. 2013. Variation for selected morphological and quality-related traits among 178 faba bean landraces collected from Turkey. *Plant Genetic Resources: Characterization and Utilization*, 12(01): 5-13.

Mc Donald MB and Copeland LO., 1997. *Seed Production Principles and Practices*. Grain legumes, pp. 591, Newyork.

Öziç H., 2014. Özel sektör açısından yemeklik baklagil tohumculuğumuz. *Türkiye Tohumcular Birliği Dergisi*, 1: 50-52.

- Özer S., Karaköy, T., Toklu, F., Baloch, F.S., Kilian B and Özkan H., 2010. Nutritional and physicochemical variation in Turkish kabuli chickpea (*Cicer arietinum* L.) landraces. *Euphytica*, 175(2): 237-249.
- Sule B and Ojo PO., 2008. Quality control measures for seed production of legumes and cereals. *Legume and Cereal Seed Production for Improved Crop Yields in Nigeria* (Eds: HA. Ajeigbe., T.Abdoulaye and D. Chikoye). Proceedings of the training workshop on production of legume and cereal seeds. pp. 48-57. 24 January-10 February, Kano, Nigeria.
- Şehirali S., 1988. Yemelik Dane Baklagiller. A.Ü. Ziraat Fakültesi Yayınları: 1089, Ders Kitabı: 314. 435 s.
- Tohumluk Tescil ve Sertifikasyon Müdürlüğü 2008. Yemelik tane baklagiller ve yembitkileri tohum sertifikasyonu ve pazarlaması yönetmeliği. Gıda Tarım ve Hayvancılık Bakanlığı, [www.tarim.gov.tr](http://www.tarim.gov.tr). [Erişim: 20 Aralık 2014].
- Toklu F., Karaköy T., Haklı E., Brandolini A., Kilian B and Özkan H., 2009. Genetic variation among lentil (*Lens culinaris* Medik) landraces from southeast Turkey. *Plant Breeding*, 128: 178-186.
- TÜİK 2014. Türkiye İstatistik Kurumu. <http://www.tuik.gov.tr> [Erişim: 06 Ocak 2015].
- Utoh NO and Ajeigbe HA., 2008. Dissemination of legume and cereal certificated seeds using the community seed approach. *Legume and Cereal seed Production for Improved Crop yields in Nigeria* (Eds: HA. Ajeigbe., T.Abdoulaye., and D. Chikoye). Proceedings of the Training Workshop on Production of Legume and Cereal Seeds. pp. 61-63. 24 January -10 February, Kano, Nigeria.