

Confectionery Sunflower Hybrid Breeding Studies in Turkey: Current and Future Strategies

Yalcin Kaya and Necmi Beser

Trakya University, Engineering Faculty, Genetic and Bioengineering
Department, Edirne, Turkey. Email: yalcinkaya22@gmail.com

Abstract

Sunflower (*Helianthus annuus* L.) is mainly grown as an oilseed in the world, but it is also one of most preferable for confectionery seeds. Confectionery production is generally produced on irrigated lands to obtain bigger kernel sizes, but it also produced on dryland with lower plant densities. As a summer crop, sunflower is affected by higher summer temperatures, especially during the grain filling period leading to more empty seeds. On the other hand, some biotic stress such as broomrape parasite (*Orobanche*), rust, *Verticillium*, downy mildew and weeds are the main yield reducing factors of confectionery sunflower. Although open-pollinated (OP) seed still exists in the world production, a big portion in some countries, confectionery hybrids provide higher seed yields and quality, homogenous and bigger size seeds, and are the main sunflower grown in almost all parts of the world. Therefore, most of confectionery sunflower breeding programs in the world focus on the develop of new hybrids having tolerance genes to biotic and abiotic stresses in addition to higher seed yield, bigger kernel sizes and greater adaptation capability. In Turkey, most confectionery seed is local OP seed (Inegol type). Turkish people mostly like consuming white colored seed with grey stripes, so all the production in Turkey is from these OP seeds. Although there are some registered confectionery hybrids in recent years, they are not yet a considerable part of the market share in Turkey. On the other hand, Clearfield system hybrids resistant to Imidazolinone (IMI) herbicide which controls both broomrape and also key weeds are starting to dominate markets in oil types, as well as the confectionery seed sector. The development of resistance genes to new races of broomrape and other diseases are not easy in confectionery

sunflower breeding, so IMI types solve both broomrape problem and especially broad-leaf weeds which are two devastating problems in sunflower production. On the other hand, higher oleic acid and tocopherols (vitamin E) content in the seeds increase both shelf life, and also nutritional quality of confectionery sunflower seed. Besides, some molecular methods especially MAS selection are useful tools both for developing new hybrids and inbred lines with greater accuracy and precision in selection accelerating breeding program in sunflower. Therefore, new confectionery sunflower inbred lines and hybrids should have resistant to both broomrape and some important diseases mentioned above and also be Clearfield type, as well as high oleic type and larger kernel size and yield capacity in the sunflower breeding program in Turkey. Furthermore, more heat tolerant hybrids, developing new plant phenotypes to increase leaf area with shorter petioles to increase plant numbers per unit area, new hybrids with increased heterosis for seed yield and quality will be main targets in sunflower breeding programs in the near future both in Turkey and other countries in the world.

Key words: confectionery sunflower, sustainable production, disease resistance, clearfield, hybrid breeding,

土耳其食葵杂交育种的研究：当前的情形和未来的发展趋势

Yalcin KAYA and Necmi BESER

Trakya University, Engineering Faculty, Genetic and Bioengineering
Department, Edirne, Turkey. Email: yalcinkaya22@gmail.com

摘要

世界上向日葵多数是油葵，但是也有一些选育出的表现优良的供消费的食葵种子。食葵生产中，为了获得较大的籽仁，一般将食葵种植在灌溉区，但是也有以相对较小的密度种植在干旱地区。作为夏季作物，向日葵易受夏季高温的影响，特别是在籽粒灌浆期高温会导致更多的空壳。另一方面，一些生物胁迫，如寄生性列当、锈病、黄萎病、霜霉病和杂草也是降低食葵产量的主要因素。尽管一些国家大部分产区仍然存在开放授粉的种子，但是食葵杂交种表现出较高的产量、质量、均匀性和以及相对较大的籽粒，这使得向日葵杂交种的种植在世界向日葵产区几乎很普遍。因此，世界上多数食葵育种项目集中在培育新的除了籽粒产量高、籽仁大和适应性强外含有耐生物和非生物胁迫基因的杂交种。在土耳其，多数食葵属于开放授粉的农家种（Inegol type）。土耳其人多数喜欢消费白底灰条纹的葵花籽，所以土耳其的所有种植区种植的都是上述开放授粉的种子。尽管近几年在土耳其有一些登记的食葵杂交种，但是它们在土耳其并没有占很大的市场份额。另一方面，能够控制列当和主要杂草的抗咪唑啉酮类（IMI）除草剂的 Clearfield System 杂交种开始占领油葵和食葵市场。因为在食葵育种上培育含有抗列当新的生理小种和其它病害基因（的品种）并不容易，所以 IMI 型在向日葵生产中可以解决列当和阔叶杂草两大难题。另一方面，食葵种子中油酸和维生素 E 含量高，它们可以延长保质期并且提高营养质量。此外，一些分子方法，如分子标记辅助选择（MAS）是很有用的工具，在向日葵新品种和自交系选育中可以为育种家提供准确的信息，

同时也能够加快育种进度。因此，土耳其向日葵的育种目标是使新的食葵自交系和杂交种具有抗列当、抗上述提到的重要的病害、抗 IMI 除草剂等特性，同时要像油葵一样籽仁大且高产。此外，培育更多的耐热杂交种，培育新的有较大叶面积且短柄的植株而增加单位面积株数，并培育新的在籽粒产量和质量上有更好的杂种优势的杂交种，将在今后在土耳其和世界上其它国家成为主要的针对向日葵育种的目标。

关键词：食葵，可持续生产，抗病性，Clearfield