Bölüm 14

SEBZELERDE AŞILI FİDE KULLANIMI

Hakan AKTAŞ[1]

AŞILI SEBZE FİDESİNİN TARİHİ VE AMACI

Aşılama iki bitkinin (anaç ve kalem) bir araya getirilerek tek bir bitki gibi yetiştirilme tekniğidir. Sebzelerde aşılama Kore'de 17. yy da başlamış, [36] daha sonra 20 yy. da toprak kökenli patojenlere karşı yapılmıştır [38]. Ticari olarak kullanım ise 1930 yılında Japonya'da su kabağı üzerine karpuz aşılanmasıyla başlamıştır. *Solanacea* grubu içerisinde ise ilk aşılama 1950'li yıllarda *Solanum melongona* türünün *Solanum integrifolium* üzerine aşılanması ile başlamıştır [44] . Son yıllarda ise; sebzelerde aşılama, genellikle toprak kökenli hastalık etmenlerine dayanıklılığı sağlamak için yapılmaya başlamıştır [1],[4],[7], [50], [51], [30], [23], [55], [58], [2], [54]. Daha sonra ise aşılama düşük toprak sıcaklığı, kuraklık, tuzluluk gibi abiyotik stres koşullarına karşı kullanılmaya başlanmıştır [57], [19], [18], [52], [61], [46].

Genel olarak bakıldığında ise abiotik ve biotik stres yanında verim ve kalite artışını sağlamak hedefli olarak da kullanılmaktadır[28], [3], [43], [10], [62], [19], [37], [56], [55].

Aşılama bazı araştırmalarda ise kullanılan aşı yönteminin meyvede kalite kriterleri olan; pH, tat, şeker içeriği, renk, karotenoid içeriği ve tekstür gibi faktörler üzerine önemli etkileri olduğu yönündedir[12]. Ülkemizde aşılama tarihi çok eski olmayıp, karpuz/kabak aşılanması ile başlamıştır. Ancak son yıllarda hızlı bir artış göstermiştir (Çizelge 1).

Ayrıca aşılama Fusarium spp. ve nematod gibi patojenlerle mücadele edilmesi, toprak sıcaklığının düşük ve düşük hava sıcaklığına tolerens sağlaması, toprak tuzluluğu ve yüksek nem gibi abiyotik stres faktörlerine toleranslı olması nedeniyle bitkilerin topraktan suyu ve besin maddelerini daha iyi alınımını ve kullanımını sağlayabilmektedir[29], [49], [62] [37], [14], [42].

[1] Prof. Dr. Isparta Uygulamalı Bilimler Üniversitesi, Ziraat Fakültesi, Bahçe Bitkileri Bölümü, Isparta, hakanaktas@isparta.edu.tr

KAYNAKLAR

1. Ahn, S. J., Im, Y. J., Chung, G. C., Cho, B. H., & Suh, S. R. (1999). Physiological responses of grafted-cucumber leaves and rootstock roots affected by low root temperature. *Scientia Horticulturae*, 81(4), 397-408.
2. Arwiyanto, T., Lwin, K., Maryudani, Y., & Purwantoro, A. (2014, March). Evaluation of local *Solanum torvum* as a rootstock to control Ralstonia solanacearum in Indonesia. *In I International Symposium on Vegetable Grafting* 1086 (pp. 101-106).
3. Asao, T., Shimizu, N., Ohta, K., & Hosoki, T. (1999). Effect of rootstocks on the extension of harvest period of cucumber (*Cucumis sativus L.*) grown in non-renewal hydroponics. *Journal of the Japanese Society for Horticultural Science*, 68(3), 598-602.
4. AVRDC, (2001). Improvement and Stabilisation Year-Round Vegetable Suppliers. Report No: 4, 2s.
5. Bekar, N.K., Balkaya, A., Göçmen, M. 2016. Kabak Anaçlarının Aşılı Hıyar Yetiştiriciliğinde Vejetatif Büyüme Üzerine Etkilerinin Belirlenmesi, *Selçuk Tarım Bilimleri Dergisi*,3(2), 280-295.
6. Bhatt, R. M., Upreti, K. K., Divya, M. H., Bhat, S., Pavithra, C. B., & Sadashiva, A. T. (2015). Interspecific grafting to enhance physiological resilience to flooding stress in tomato (*Solanum lycopersicum L.*). *Scientia Horticulturae*, 182, 8-17.
7. Black, L. L., Wu, D. L., Wang, J. F., Kalb, T., Abbass, D., & Chen, J. H. (2003). Grafting tomatoes for production in the hot-wet season. Asian Vegetable Research & Development Center. *AVRDC Publication*, 3, 551.
8. Bletsos, F. A. (2005). Use of grafting and calcium cyanamide as alternatives to methyl bromide soil fumigation and their effects on growth, yield, quality and fusarium wilt control in melon. *Journal of Phytopathology*, 153(3), 155-161.
9. Colla, G., Pérez-Alfocea, F., & Schwarz, D. (2017). *Vegetable grafting: principles and practices*. CABI.
10. Colla, G., Rouphael, Y., Cardarelli, M., Temperini, O., Rea, E., Salerno, A., & Pierandrei, F. (2006, December). Influence of grafting on yield and fruit quality of pepper (*Capsicum annuum L.*) grown under greenhouse conditions. *In IV International Symposium on Seed, Transplant and Stand Establishment of Horticultural Crops; Translating Seed and Seedling* 782 (pp. 359-364).
11. Condurso, C., Verzera, A., Dima, G., Tripodi, G., Crinò, P., Paratore, A., & Romano, D. (2012). Effects of different rootstocks on aroma volatile compounds and carotenoid content of melon fruits. *Scientia horticulturae*, 148, 9-16.
12. Davis, A. R., King, S. R., Perkins Veazie, P. M., & Levi, A. (2007). Grafting Effects on Vegetable Quality. *HortScience*, 42(4), 802.
13. Dong, D. F., Cao, Z. P., Wang, X. H., Hu, J., & Gullino, M. L. (2007). Effect of nematode resistant rootstocks on growth characteristics and yields of tomato, *Acta Hortıculturae Sınıca*, 34(5):1305-1308,
14. Geboloğlu, N., Yılmaz, E., Aydın, M., & Kasap, Y. (2011). Determining of the yield, quality and nutrient content of tomatoes grafted on different rootstocks in soilless culture. *Scientific Research and Essays*, 6(10), 2147-2153.
15. Gilardi, G., Gullino, M. L., & Garibaldi, A. (2013). Critical aspects of grafting as a possible strategy to manage soil-borne pathogens. *Scientia Horticulturae*, 149, 19-21.
16. Gisbert, C., Prohens, J., Raigón, M. D., Stommel, J. R., & Nuez, F. (2011). Eggplant relatives as sources of variation for developing new rootstocks: Effects of grafting on eggplant yield and fruit apparent quality and composition. *Scientia Horticulturae*, 128(1), 14-22.
17. Goreta, S., Perica, S., Dumicic, G., Bucan, L., & Zanic, K. (2005). Growth and yield of watermelon on polyethylene mulch with different spacings and nitrogen rates. *HortScience*, 40(2), 366-369.

18. Huang, Y., Bie, Z., He, S., Hua, B., Zhen, A., & Liu, Z. (2010). Improving cucumber tolerance to major nutrients induced salinity by grafting onto *Cucurbita ficifolia*. *Environmental and Experimental Botany*, 69(1), 32-38.
19. Huang, Y., Tang, R., Cao, Q., & Bie, Z. (2009). Improving the fruit yield and quality of cucumber by grafting onto the salt tolerant rootstock under NaCl stress. *Scientia Horticulturae*, 122(1), 26-31.
20. Huitrón, M. V., Diaz, M., Diánez, F., & Camacho, F. (2007). The effect of various rootstocks on triploid watermelon yield and quality. *Journal of Food Agriculture and Environment*, 5(3/4), 344.
21. Itagi, T. (1992). Status of transplant production systems in Japan and new grafting technics. In Symp. Protected Hort. Hort. Expt. Sta., Rural Development Admin., Suwon, Republic of Korea (pp. 32-67).
22. Ito, T. (1992). Present state of transplant production practices in Japanese horticultural industry. In Transplant production systems (pp. 65-82). *Springer, Dordrecht*.
23. Jang, Y., Yang, E., Cho, M., Um, Y., Ko, K., & Chun, C. (2012). Effect of grafting on growth and incidence of Phytophthora blight and bacterial wilt of pepper (*Capsicum annuum L.*). *Horticulture, Environment, and Biotechnology*, 53(1), 9-19.
24. Jeong, S. J. (1986). Effects of several rootstocks on the growth, fruit yield and quality of 2 cucumber cultivars. Research Collection-Kyunghee University (Korea Republic).
25. Johnson, S., Kreider, P. and Miles, C. (2011) Vegetable grafting eggplants and tomatoes. Washington State University Extension Fact Sheet, FS052E, Washington State University, Washington, DC.
26. Karaca, F. (2010). *Akdeniz Havzasından Toplanmış Olan Sukabakları Üzerine Aşılı Crimson Tide Karpuz Çeşidinin Verim ve Kalite Özellikleri.* (Yüksek Lisans, Mustafa Kemal Üniversitesi, Fen Bilimleri Enstitüsü)
27. Kato, T., & Lou, H. (1989). Effects of rootstock on the yield, mineral nutrition and hormone level in xylem sap in eggplant. *Journal of the Japanese Society for Horticultural Science*, 58(2), 345-352.
28. Kim, H. T., Kang, N. J., & Kang, K. Y. (1998). Selection of" PusanDaemok 1" for high yield and quality in rootstock of cucumber. RDA Journal of *Horticulture Science* (1).
29. Kim, S. E. (1989). Effect of rootstocks and fertilizers on the growth and mineral contents in cucumber (*Cucumis sativus L.*). Res. Collection, 10, 75-82)
30. King, S. R., Davis, A. R., Liu, W., & Levi, A. (2008). Grafting for disease resistance. *HortScience*, 43(6), 1673-1676.
31. Ko, K. D. (1999). *Response of cucurbitaceous rootstock species to biological and environmental stresses*. PhD Thesis, Seoul Nat'l Univ., Korea.
32. Krumbein, A., & Schwarz, D. (2013). Grafting: a possibility to enhance health-promoting and flavour compounds in tomato fruits of shaded plants. *Scientia Horticulturae*, 149, 97-107.
33. Kubota, C., McClure, M. A., Kokalis-Burelle, N., Bausher, M. G., & Rosskopf, E. N. (2008). Vegetable grafting: History, use, and current technology status in North America. *HortScience*, 43(6), 1664-1669.
34. Kumar, P., Lucini, L., Rouphael, Y., Cardarelli, M., Kalunke, R. M., & Colla, G. (2015). Insight into the role of grafting and arbuscular mycorrhiza on cadmium stress tolerance in tomato. *Frontiers in Plant Science*, 6, 477.
35. Kyriacou, M. C., Soteriou, G. A., Rouphael, Y., Siomos, A. S., & Gerasopoulos, D. (2016). Configuration of watermelon fruit quality in response to rootstock-mediated harvest maturity and postharvest storage. *Journal of the Science of Food and Agriculture*, 96(7), 2400-2409.
36. Lee, J. M. (2003). Grafting of herbaceous vegetable and ornamental crops. Hortic. Rev., 28, 61-124.

37. Lee, J. M., Kubota, C., Tsao, S. J., Bie, Z., Echevarria, P. H., Morra, L., & Oda, M. (2010). Current status of vegetable grafting: Diffusion, grafting techniques, automation. *Scientia Horticulturae*, 127(2), 93-105.
38. Louws, F. J., Rivard, C. L., & Kubota, C. (2010). Grafting fruiting vegetables to manage soilborne pathogens, foliar pathogens, arthropods and weeds. *Scientia Horticulturae*, 127(2), 127-146.
39. Maynard, D. N. (2001). Watermelons: characteristics, production, and marketing. *ASHS Press*.
40. Miles, C., Wimer, J., & Inglis, D. (2014, March). Grafting eggplant and tomato for Verticillium wilt resistance. *In I International Symposium on Vegetable Grafting* 1086 (pp. 113-118).
41. Mohamed, F. H., Abd El-Hamed, K. E., Elwan, M. W. M., & Hussien, M. N. E. (2014). Evaluation of different grafting methods and rootstocks in watermelon grown in Egypt. *Scientia Horticulturae*, 168, 145-150.
42. Nawaz, M. A., Imtiaz, M., Kong, Q., Cheng, F., Ahmed, W., Huang, Y., & Bie, Z. (2016). Grafting: a technique to modify ion accumulation in horticultural crops. *Frontiers in plant science*, 7, 1457.
43. Nisini, P. T., Colla, G., Granati, E., Temperini, O., Crino, P., & Saccardo, F. (2002). Rootstock resistance to fusarium wilt and effect on fruit yield and quality of two muskmelon cultivars. *Scientia Horticulturae*, 93(3-4), 281-288.
44. Oda, M. (2002). Jung-Myung Lee Kyung Hee University Department of Horticulture Suwon, 449-701, Korea. Horticultural Reviews, 28, 61.
45. Penella, C., Nebauer, S. G., San Bautista, A., López-Galarza, S., & Calatayud, Á. (2014). Rootstock alleviates PEG-induced water stress in grafted pepper seedlings: physiological responses. Journal of plant physiology, 171(10), 842-851.
46. Penella, C., Nebauer, S. G., Quinones, A., San Bautista, A., López-Galarza, S., et all. (2015). Some rootstocks improve pepper tolerance to mild salinity through ionic regulation. *Plant science*, 230, 12-22.
47. Proietti, S., Rouphael, Y., Colla, G., Cardarelli, M., De Agazio, M., Zacchini, M., et all. (2008). Fruit quality of mini-watermelon as affected by grafting and irrigation regimes. *Journal of the Science of Food and Agriculture*, 88(6), 1107-1114.
48. Rouphael, Y., Schwarz, D., Krumbein, A., & Colla, G. (2010). Impact of grafting on product quality of fruit vegetables. *Scientia Horticulturae*, 127(2), 172-179.
49. Ruiz, J. M., Belakbir, A., López-Cantarero, I., & Romero, L. (1997). Leaf-macronutrient content and yield in grafted melon plants. A model to evaluate the influence of rootstock genotype. *Scientia Horticulturae*, 71(3-4), 227-234.
50. Sugiyama, M., Sakata, Y., & Ohara, T. (2006, August). The history of melon and cucumber grafting in Japan. In XXVII International Horticultural Congress-IHC2006: *International Symposium on Sustainability through Integrated and Organic* 767 (pp. 217-228).
51. Sakata, Y., Sugiyama, M., Ohara, T. and Morishita, M. (2006) Influence of rootstocks on the resistance of grafted cucumber (*Cucumis sativus* L.) scions to powdery mildew (*Podosphaera xanthii* U. Braun & N. Shishkoff). *Journal of Japanese Society for Horticultural Sciences* 75, 135–140.
52. Schwarz, D., Rouphael, Y., Colla, G., & Venema, J. H. (2010). Grafting as a tool to improve tolerance of vegetables to abiotic stresses: Thermal stress, water stress and organic pollutants. *Scientia Horticulturae*, 127(2), 162-171.
53. Shibuya, T., Itagaki, K., Wang, Y., & Endo, R. (2015). Grafting transiently suppresses development of powdery mildew colonies, probably through a quantitative change in water relations of the host cucumber scions during graft healing. *Scientia Horticulturae*, 192, 197-199.
54. Suchoff, D., Gunter, C., Schultheis, J., & Louws, F. J. (2014, March). On-farm grafted tomato trial to manage bacterial wilt. *In I International Symposium on Vegetable Grafting* 1086 (pp. 119-127).

55. Temperini, O., Calabrese, N., Temperini, A., Rouphael, Y., Tesi, R., Lenzi, A., et all.(2013). Grafting artichoke onto cardoon rootstocks: Graft compatibility, yield and Verticillium wilt incidence. *Scientia Horticulturae*, 149, 22-27.

56. Tsaballa, A., Athanasiadis, C., Pasentsis, K., Ganopoulos, I., Nianiou-Obeidat, I., et all. (2013). Molecular studies of inheritable grafting induced changes in pepper (*Capsicum annuum*) fruit shape. *Scientia Horticulturae,* 149, 2-8.

57. Venema, J. H., Dijk, B. E., Bax, J. M., van Hasselt, P. R., & Elzenga, J. T. M. (2008). Grafting tomato (*Solanum lycopersicum*) onto the rootstock of a high-altitude accession of *Solanum habrochaites* improves suboptimal-temperature tolerance. *Environmental and Experimental Botany*, 63(1-3), 359-367.

58. Vitale, A., Rocco, M., Arena, S., Giuffrida, F., Cassaniti, C., Scaloni, A., et all. (2014). Tomato susceptibility to Fusarium crown and root rot: Effect of grafting combination and proteomic analysis of tolerance expression in the rootstock. *Plant Physiology and biochemistry*, 83, 207-216.

59. Wahb-Allah, M. A. (2014). Effectiveness of grafting for the improvement of salinity and drought tolerance in tomato (*Solanum lycopersicon L.*). *Asian Journal of Crop Science*, 6(2), 112-122.

60. Xing, W. W., Li, L., Gao, P., Li, H., Shao, Q. S., Shu, S., ... & Guo, S. R. (2015). Effects of grafting with pumpkin rootstock on carbohydrate metabolism in cucumber seedlings under Ca (NO3) 2 stress. *Plant Physiology and Biochemistry*, 87, 124-132.

61. Yang, Y., Lu, X., Yan, B., Li, B., Sun, J., Guo, S., & Tezuka, T. (2013). Bottle gourd rootstock-grafting affects nitrogen metabolism in NaCl-stressed watermelon leaves and enhances short-term salt tolerance. *Journal of plant physiology*, 170(7), 653-661.

62. Yarşi, G., & SARI, N. (2006). Aşılı fide kullanımının sera kavun yetiştiriciliğinde beslenme durumuna etkisi. *Alatarım*, 5(2), 1-8.

63. Yetişir, H., Yarşi, G., & Sarı, N. (2004). 'Sebzelerde aşılama'. *Bahçe Haber, 33 (1- 2),* 27- 37.

64. Zhao, X., Guo, Y., Huber, D. J., & Lee, J. (2011). Grafting effects on postharvest ripening and quality of 1-methylcyclopropene-treated muskmelon fruit. *Scientia Horticulturae*, 130(3), 581-587.

65. Aloni, B., Karni, L., Deventurero, G., Levin, Z., Cohen, R., Katzir, N., et all. (2008). Physiological and biochemical changes at the rootstock-scion interface in graft combinations between Cucurbita rootstocks and a melon scion. *The Journal of Horticultural Science and Biotechnology*, *83*(6), 777-783.

66. Aloni, B., Karni, L., Deventurero, G., Levin, Z., Cohen, R., Katzir, N., et all. (2006, December). Possible mechanisms for graft incompatibility between melon scions and pumpkin rootstocks. In *IV International Symposium on Seed, Transplant and Stand Establishment of Horticultural Crops; Translating Seed and Seedling 782* (pp. 313-324).

67. Ergun, V., & Aktas, H. (2018). Effect of grafting on yield and fruit quality of pepper (*Capsicum annuum L.*) grown under open field conditions. *Scientific-Papers Series B-Horticulture*, *62*, 463-466.

68. Aktaş, H. (2020). Domateste Kullanılan Farklı Anaçların Bitki Büyümesi, Verim ve Meyve Kalitesi Üzerine Etkilerinin Belirlenmesi. *Ziraat Fakültesi Dergisi*, *15*(1), 27-40.

69. Aktaş, H., & Üre, H. S. (2019). Farklı Anaçlar Üzerine Aşılamanın Hıyarlarda Bitki Büyümesi, Verim ve Kalite Üzerine Etkileri. *Türk Bilim ve Mühendislik Dergisi*, *1*(1), 17-22.