

The Fruiting Species of the Solanaceae

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The family Solanaceae includes approximately 75 genera and 2000 species of herbs, shrubs and small trees. The most important vegetables are the potato (*Solanum tuberosum* L.), tomato (*Lycopersicon esculentum* Mill. syn. *Solanum lycopersicon* L.), pepper (*Capsicum annuum* L. and *C. frutescens* L.) and eggplant (*Solanum melongena* L.). The potato is the widest grown of all root crops and a staple food for many people. If to this as a primary source of starch we add tomatoes, peppers and eggplants as vegetables rich in essential vitamins, nutrients and antioxidants, it is clear that a healthy human diet can be maintained on the basis of four species of this family alone. Indeed when the various processed forms of these same species are also taken into consideration (e.g. potato chips, potato-based alcoholic drinks, tomato ketchup, tomato juice, pepper seasoning, etc.), the variety provided to the human diet by these few species must surely be more than that in any other single plant family.

Apart from the above, the Solanaceae also contains a number of minor tropical fruiting species, such as the tree tomato (*Cyphomandra betacea* Cav. Sendt.) of the Andes and the Cape gooseberry (*Physalis peruviana* L.) also native to tropical America. Moreover, it is the exclusive source of tobacco (*Nicotiana rustica* L. and *N. tabacum* L.), and contains numerous drug-yielding plants including belladonna (*Atropa belladonna* L.), a source of atropine, and thorn apple (*Datura stramonium* L.) which yields the drug stramonium.

The series of reviews presented in this volume of the European Journal of Plant Science and Biotechnology is devoted to the principal fruiting vegetables of the Solanaceae (tomato, pepper and eggplant), with particular reference to greenhouse production. According to the FAO (2007), world production of tomatoes is estimated to amount to over 126

million tonnes (MT), compared with 32 MT eggplants and 26 MT peppers (Fig. 1). This production is obtained from a total land area of over 4.6 million ha (tomato), 2.0 million ha (eggplant) and 1.7 million ha (pepper) (Fig. 1). Approximately 65% of the total land area cultivated by tomatoes and peppers is in Asia, which accounts for 55% and 67% of the total production respectively, while 95% of the area devoted to eggplant cultivation is located in Asia, accounting for over 90% of world production (Fig. 2). Although reliable data for the extent of production under cover are difficult to obtain due to rapid changes within this sector, it is likely to far exceed the 2001 estimate of 723,000 ha (Jouet 2001), particularly in view of the significant expansion of greenhouse crops in China. Within the Mediterranean Basin, there are approximately 170,000 ha of greenhouses and large tunnels, increasing to over 300,000 ha if low tunnels are also included in the total (Pardossi *et al.* 2004). The major centres of greenhouse production within the Mediterranean area are Italy and Spain, which account for over 110,000 ha of greenhouses and large tunnels, followed by Turkey (21,000 ha), Morocco (10,000 ha) and France (9,000 ha). Solanaceous vegetables together with cucurbits account for over 80% of the total area (Pardossi *et al.* 2004), with tomato being the most important single species overall. On average, the greenhouse yield of tomato in the Almeria region of Spain is between 14.0 kg m⁻² (long cycle crop) and 10.5 kg m⁻² (short cycle crop), compared with 6.7 kg m⁻² (eggplant) and 5.7 kg m⁻² (sweet pepper) (Castilla and Hernández 2005).

The importance of the Solanaceous crops is also indicated by the large volume of research devoted to their production, improvement and utilization. In the present reviews we have concentrated primarily on selected topics related to

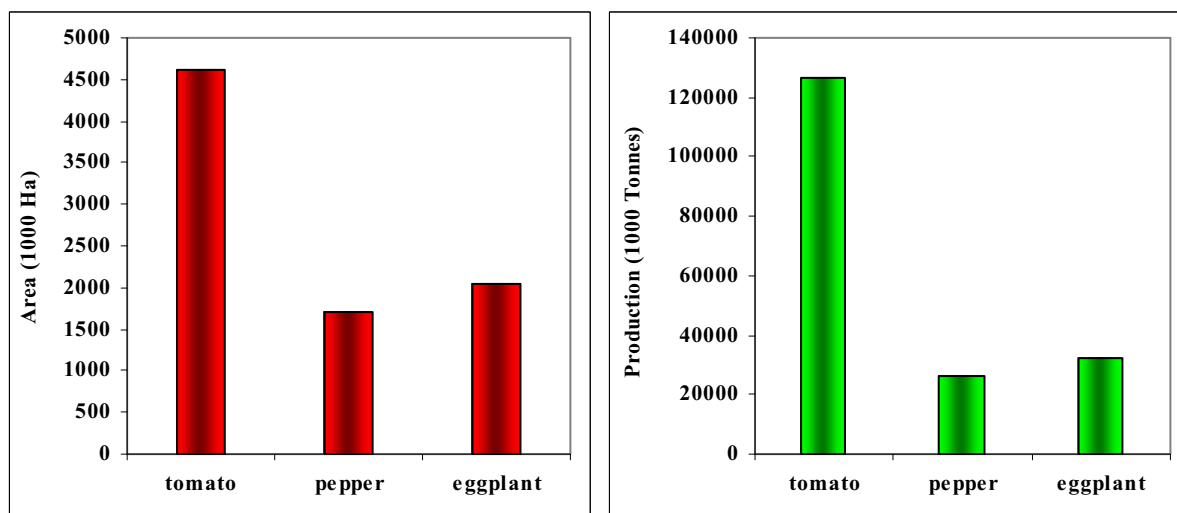


Fig. 1 World production of tomato, pepper and eggplant in relation to the area of land under cultivation (FAO 2007).

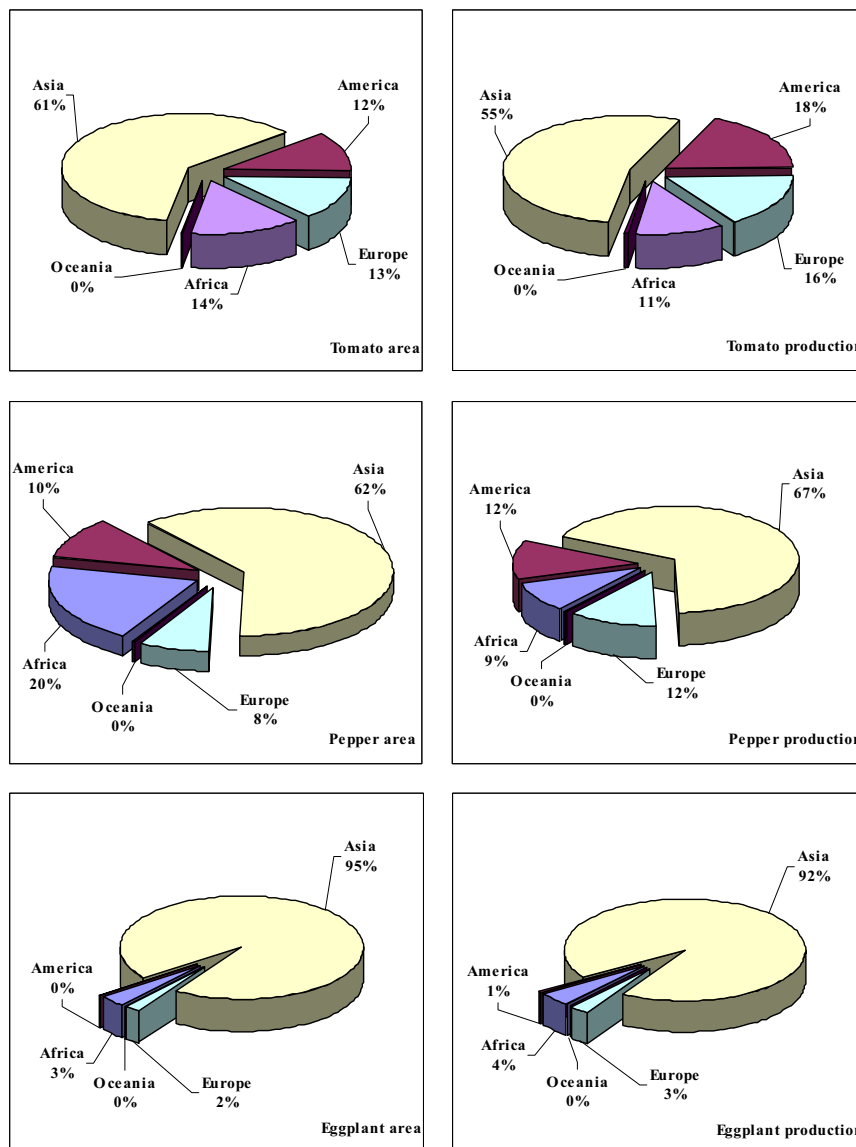


Fig. 1 The relative area of land per continent cultivated with tomato, pepper and eggplant and the respective production of each crop (FAO 2007).

crop production and quality:

1. Genetic resources and advances in plant breeding.
2. The greenhouse environment.
3. Plant nutrition and physiological disorders.
4. Rootstocks and grafting.
5. Production of certified produce/organic crops.
6. Flowering, pollen viability and fruit set.
7. Plant protection - pathology.
8. Integrated pest management.
9. Fruit ripening physiology and the use of plant growth regulators.
10. Fruit quality in relation to post-harvest handling, storage and marketing practices.

In each of these fields members of staff of the Agricultural University of Athens and their collaborators are actively engaged in research. The authors present an overall review of recent research achievements and developments in each field, as well as adding their own assessment of future perspectives. However, this work is by no means exhaustive. Over 3000 research papers are published each year on the Solanaceous fruiting vegetables, of which approximately 70% concern tomato, 25% pepper and 5% eggplant. Therefore, it has been necessary to be selective, and certain areas of work have been omitted, for example research relating to processing and processed products. More-

over, other areas could be enlarged upon, e.g. the effects of stress on crop growth and production, which is such a significant topic in our present changing world.

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REFERENCES

- Castilla N, Hernández J (2005) The plastic greenhouse industry of Spain. *Chronica Horticulturae* 45 (3), 15-20
- FAO (2007) Available online. <http://faostat.fao.org/site/567/default.aspx#ancor>
- Jouet J-P (2001) Plastics in the world. *Plasticulture* 120, 108-126
- Pardossi A, Tognoni F, Incrocci L (2004) Mediterranean greenhouse technology. *Chronica Horticulturae* 44 (2), 28-34