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Integrated Fruit Production in Bulgaria – State-of-the-Art, Tendencies and Ecologically Sound Approaches to Producing Safe Fruits

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Abstract: The present study treats some major elements of integrated fruit production as a modern approach to obtaining top quality, ecologically pure fruit produce – choosing suitable cultivars and cultivar-rootstock combinations, integrated approaches to disease, pest and weed management, irrigation and soil maintenance systems in fruit plantations. The combined approach to pest control, good agricultural practices and the use of pesticide products with confirmed selectivity, suitable for application under integrated fruit production conditions, as well as the search for alternative approaches to limit the use of agrochemicals, ensure that the crops are maintained in good agricultural and ecological condition. Integrated fruit production as an organizational form in fruit growing is the modern ecologically-oriented fruit production. Knowledge of its basic principles is essential to adapting fruit growing to the European requirements for the production of competitive fruit produce and preservation of the environment and biodiversity.

Key words: fruit growing, cultivars, pest control, integrated fruit production.

Introduction

Fruit growing is among the major sub-branches of agriculture in Bulgaria and its development is favoured by suitable soil and climatic conditions, a rich genetic fund of local and introduced cultivars, production experience and established national traditions. It is known that growing fruit crops increases crop production efficiency by raising profit per unit of area, reclaiming poorer in humus areas and sloping terrains (Zhivondov et al. 2008).

The increasing use of agricultural machinery and agrochemical inputs in the mid 20th century and their higher rate of diffusion in fruit-growing in parallel with the positive effect on the intensification of the production processes caused a number of negative consequences in ecological terms – soil erosion, contamination with nitrates, accumulation of residual pesticides in the soil and fruit crops (Zhivondov et al. 2009). Modern fruit growing is still directed towards the intensive cultivation of fruit plants with the aim of achieving high quality and competitive fruit production. On the other hand, greater attention is paid to food quality and safety in fruit production.

As a full EU member state, Bulgaria has entered the global fresh and processed fruit market. In that respect, Bulgarian fruit growing faces the necessity of complying with the European fruit quality and safety standards.

According to data provided by the Ministry of Agriculture and Foods, the areas under fruit plantations were slightly above 45795 ha in 2011, with 38778 ha harvested, thus suggesting an almost 60% increase compared to 2009 and indicating a favourable tendency in the development of the sector. The most considerable increase was registered in walnut, plum and cherry production.

The areas under young fruit plantations are over four thousand ha. The tendency observed in the last years has been maintained, showing that the largest proportion of the total area is planted with cherries – 21.3 %, followed by plums – 16.1%, apples – 7.8 % and peaches 8.2 %. The young fruit plantations included in the miscellaneous group are mainly soft-berry fruits (such as raspberries and aronia), as well as almonds, hazelnuts and pears (Bulletin No. 176 of June 2011). The areas intended for the production of fruit planting material are 125 ha.

According to data provided by the Ministry of Agriculture and Foods, fruit production is concentrated in the South-East region – accounting for 32% of the total fruit production in the country, followed by the South Central region – 28% of the total fruit production. The South Central region is the main producer of apples, plums, sweet and sour cherries and raspberries.

The soil and climatic conditions in Bulgaria favour the development of fruit growing represented by a large number of fruit species, cultivars and cultivar-rootstock combinations.

Economic factors also play a considerable role in the development of the fruit growing sector and in increasing the interest of agricultural producers to grow

fruit crops. These factors include home and foreign markets, the developed processing industry, available energy sources, agricultural machinery, etc.

Favourable conditions for the development of European-type fruit growing are available – suitable soil and climatic conditions in the country, a rich genetic fund of local and introduced cultivars, proper regional distribution of fruit species according to the soil and climatic conditions and according to the specific biological characteristics of the cultivar-rootstock combinations, the established national traditions in growing fruit species and investment opportunities available at present. The development of the sub-branch and its establishment as a European-type agricultural sector also contributes to stimulating the interest of farmers and owners of agricultural lands in restoring fruit production. It is known that growing fruit crops is a capital consuming business, needing much labour and a considerable amount of planting material. It is necessary to continue the initiatives for stimulating and financing ecologically sound approaches with the aim of increasing the share of organic production.

The annual fruit consumption in Bulgaria amounts to approximately 38 kg per capita, while the World Health Organization recommends an annual consumption of 147 kg of fruits and vegetables (Zhivondov et al. 2007).

At present, only countries like Greece and Italy reach this level (http://ec.europa.eu/agriculture/capreform/fruitveg/index_en.htm).

The inclusion of fruit and vegetable production in the Single Payment Scheme also raises the necessity of implementing measures to protect the environment and, like any operational programme, it should spare at least 20% of the costs to promote such activities.

The analysis of fruit production in Bulgaria suggests that the process of transferring fruit growing to the European requirements for a modern and environmentally-oriented fruit production should continue. For this purpose, it is necessary to identify specific approaches for fast synchronization of Bulgarian fruit growing to the European standards for high quality, competitiveness of the fruit production and safe food production against the background of improving the living standards of people engaged in the sector. This reflects the “sustainable development of fruit growing” as a logical development trend in the context of the Common Agricultural Policy applied in the country.

It is known that on a world scale, fruit production is realized by three major systems – conventional, integrated and organic.

Conventional fruit production is practised by using traditional fruit growing technologies that apply large amounts of agrochemicals – mineral fertilizers, pesticides and growth regulators. This fruit growing system achieves the highest production efficiency but the fruit produce is of degraded quality in ecological terms, characterized by the presence of pesticide residues, nitrates, heavy metals, etc. (above the alert threshold).

The adverse effects of the intensive use of agrochemical inputs in fruit growing in the 1980s are already known – soil and groundwater were contaminated with pesticide residues and nitrates. The increased application of pesticides has led to the development of resistant biotypes of pests – insects and weeds. Their control is hard, often ineffective and it requires rotation of pesticides having varied chemical contents and spectrum of activity. The harmful effects of the intensive use of agricultural machinery for maintaining the soil surface in the orchards in black fallow and the mechanical destruction of weeds are also quite serious. Frequent passing of agricultural machinery causes soil compaction and worsens its water and physical characteristics. Soil structure is strongly deteriorated due to a decrease of the humus content and the reduced amounts of organic matter going back into soil after cultivation.

Against the background of global tendencies towards ecologization of production processes in fruit growing and conservation of biodiversity, it is necessary to adapt it to the requirements of integrated fruit production. According to the definition of the International Plant Protection Organization, integrated fruit production is an economically profitable production of high quality fruits, in which priority is given to ecological approaches to minimizing the side effects of agrochemicals in order to protect the environment and human health (Djouvinov et al. 2008). Integrated fruit production is the primary method for fruit production in Europe. One of its main goals is to produce top quality and competitive fruits by protecting biodiversity, soil fertility and health of both farmers and consumers.

When implementing integrated fruit production practices, it is essential to make the right choice of suitable cultivars and cultivar-rootstock combinations according to the specific conditions of the region, in order to ensure successful fruit growing. This allows growing cultivars under such conditions that enable them to show maximum performance in terms of their productive capacities and to get the best use of the available vegetation factors – temperature, precipitation, sunshine duration, risk of late spring frosts, etc. In ecological terms, it is appropriate to include cultivars that show confirmed resistance to economically important diseases and pests. This reduces the risk of fruit quality deterioration due to injuries and creates a real opportunity to reduce pesticide use.

The Fruit Growing Institute – Plovdiv stores, studies and manages the major share of the national genetic fund of fruit species, forms and cultivars, including local samples showing a high level of resistance to pests and abiotic stress. As a result of continuous enrichment of the genetic fund and based on profound studies, conditions were created in the 1980s for initiating new breeding programmes, the aims of which are constantly updated according to the changes in the genetic fund and the market requirements for fruit quality. The significant progress in the development of biotechnologies during the same period provided new, much larger opportunities, for the combined application of conventional and

in vitro methods for the creation of hybrids and cultivars of early ripening parental combinations. The introduction of molecular technologies in the processes of breeding new fruit cultivars is a guarantee of a better success of the breeding programmes. Cultivars exhibiting resistance or tolerance to economically important diseases and pests are recommended as suitable for growing in the country under integrated fruit production conditions.

The dessert cultivars 'Aheloy' and 'Remil' and the canning ones 'Malo Konare' and 'Stoyka' are resistant to powdery mildew as the most economically important disease in peach. This also refers to the latest breeding results on dessert cultivars – 'Laskava' and 'Evmolpiya', the latter being also resistant to peach curl leaf disease. Among the newest cultivars, the dessert one 'Puldin' and the nectarine 'Gergana' show a marked resistance to drought (Zhivondov et al. 2004; Zhivondov et al. 2008).

The introduced plum cultivars 'Cacanska Najbolja', 'Cacanska Lepotica', 'Pacific', 'Stanley', 'Green Gage', 'Reine Claude d'Altan', 'Nancy Mirabelle', etc. are tolerant to plum pox virus disease. The newly introduced plum cultivar 'Jojo' is resistant to PPV disease. The latest Bulgarian plum cultivars 'Sineva', 'Ulpia', 'Ostromila' and 'Plovdivska Renkloda' are characterized by higher yield and tolerance to plum pox disease (Zhivondov et al. 2004; Zhivondov et al. 2008).

As regards cherry production, new plantations should be established using cultivars bearing large-size fruit that have a very early ripening period, as well as very late self-fertile cultivars with large fruits, all of them with a marked resistance to fruit cracking and to the diseases cylindrosporiosis and monilia. The latest Bulgarian very early cultivars 'Kossara' and 'Rosita' best meet these requirements. Among late ripening cultivars, priority should be given to the new Canadian self-fertile cultivars 'Sunburst', 'Sylvia', 'Samba', 'Santina', 'Sweet Heart', 'Celeste', 'Canada Giant', 'Lapins', etc. The new Bulgarian late-ripening cultivars 'Rosalina' and 'Trakiiska Hrushtyalka' are particularly interesting.

The major problems in apple fruit production are caused by the diseases powdery mildew, scab and fire blight. The drastic reduction of pear production in the country is due to the latter two diseases and to the key pest pear psylla. Apple cultivars 'Prima', 'Primrouge', 'Florina' and 'Pinova' have a high complex resistance to the causative agents of the three major diseases. Among pear cultivars, 'Beurre Hardy', 'Beurre Giffard', 'Beurre Bosc', 'Abate Fetel', etc. are less susceptible to fire blight disease.

When concerning walnut production, it is important to choose cultivars that are highly resistant to the diseases bacteriosis and walnut anthracnose.

The success of modern fruit production is related to the application of good agricultural practices that provide the most suitable conditions for the demonstration of biological and economic qualities of cultivar-rootstock

combinations and at the same time preserve environmental resources in good ecological condition.

The use of modern ecologically sound fruit growing technologies enables the transition from conventional to integrated fruit production. Ecologically sound plant protection is based on the right choice and use of pesticide products permitted in the country, rates and dates of application, as well as on monitoring of the residual amounts of pesticides in fruits and fruit products. To this end, the introduction of the Principles of Good Plant Protection Practice would help to organize the production in compliance with the European ecological criteria. Applying herbicides and fertilizers with irrigation water increases their effectiveness and economic efficiency without any undesired consequences for the crops or the environment (Rankova et al. 2009). Herbigation and fertigation are efficient technological decisions for using microirrigation systems in accordance with the principles of ecologically sound fruit production and sustainable agriculture.

This ecological approach could be applied to both integrated and organic fruit production.

Under integrated fruit production conditions, it is appropriate to apply modern soil surface maintenance systems (black fallow, a sod-mulch system, natural grassing, etc.) to protect soil structure and soil fertility and enable the restricted use of herbicides and mineral fertilizers with a high level of use of machinery in the production process (Rankova 2006; Rankova et al. 2011).

Grassing systems in fruit growing (natural grassing, cultivated grassing using a sod-mulch system) are suitable for use in damp areas and in areas under irrigation. Permanent grass sod grows in the inter-row space and the regularly mown grass is left in place and serves as mulch and green manure. Most often the grass sod is left in the inter-row space while the in-row strips are maintained free of weeds by mechanized soil tillage (rotary tillers with deviating sections) or by applying herbicide treatments. The following grass mixtures are recommended for the inter-row space – ryegrass (*Lolium perenne* L.), meadow fescue (*Festuca pratensis* Huds.), smooth meadow grass (*Poa pratensis* L.), meadow timothy (*Phleum pratense* L.), separately or in a mixture with white clover (*Trifolium repens* L.) or red clover (*Trifolium pratense* L.).

The predominant use of leaf-applied herbicides with short persistence and no residual effect provides an efficient control of weed vegetation and it is recommended for use in sloping terrains as a suitable approach to limiting soil erosion.

Ecologically sound plant protection activities under integrated fruit production conditions should be economically efficient. The basic principle underlying their use is to maintain pest populations below the economic damage threshold. This requires good knowledge of biological characteristics of pests,

causative agents of diseases and weed species and necessitates the use of good agricultural practices with the aim of preserving biodiversity.

Preventive measures for limiting the incidence and spread of pests are of utmost importance for the success of plant protection activities – location of the fruit orchard, special isolation and regular observations regarding pathogen development. Their control should be carried out by combining cultural, biological and chemical methods. An important point when choosing pesticide products is the requirement to apply only permitted active substances. For that purpose, the so-called “green list” has been prepared, including active substances permitted for use in integrated plant protection; the “yellow list” of substances permitted with restrictions and the “red list” of unpermitted pesticide products (Stancheva et al. 2008). Applying the restrictive measures in pesticide use allows obtaining fruit products consistent with the latest requirements of the European standards for integrated fruit production.

The continuation of the activities to implement the transition to integrated fruit production necessitates further training of the farmers on the basic requirements for its organization.

Conclusion

Integrated fruit production is a modern ecologically oriented production of fruits. Knowledge and introduction of its basic principles are essential to adapting fruit growing to the European requirements for producing competitive fruit products and preserving the biodiversity and the environment.

References

- Djouvinov, V., Koumanov, K., Kutinkova, H., Rankova, Z. 2008. Ecological production of apples. Belgium experience applied in Bulgaria. http://ec.europa.eu/agriculture/capreform/fruitveg/index_en.htm
- Rankova Z., Tityanov M., Tonev T. 2011. Agrotechnical approaches for maintenance of the soil surface in orchards in a good agrotechnical and ecological condition. EWRS. Proceedings of 9th Workshop of the Working Group: Physical and Cultural Weed Control, Samsun, Turkey, 28 – 30 March, 50-54
- Rankova Z. 2006. Ecological approaches for weed control in fruit plantations. Proceedings of the First International Symposium on Ecological Approaches in Safety Food Production. Academic Publishing House of the Agricultural University - Plovdiv, 211-216.
- Rankova Z., Koumanov K., Kolev K., Shilev S. 2009. Herbigation in a cherry orchard – efficiency of pendimethalin. *Acta Horticulturae*, **825**:459-464.

- Stancheva Y., Borovinova M., Andreev R., Kalinova S., Balevski N., Simova S., Velcheva N., Staneva E., Draganova S., Arnaudov A., Kolev K., Stoev A., Rankova Z., Georgieva M. 2008. Guidelines for integrated pest management in fruit crops. Ministry of Agriculture and Foods, National Plant Protection Service.
- Zhivondov A., Gercheva, P., Djouvinov V. 2004. Some results of sweet cherry breeding programme in Bulgaria. *Acta Horticulturae*, 663: 739-741.
- Zhivondov A., Manolova V., Rankova Z., Bozhkova V., Djouvinov V. 2008. Strategy for the development of fruit-growing and vegetable production in the Republic of Bulgaria for the period 2009-2013. Ministry of Agriculture and Foods, Agricultural Academy.
- Zhivondov A., Rankova Z., Dragoyski K. 2009. Organic fruit-growing in Bulgaria – state-of-the-art and perspectives, *Journal of Mountain Agriculture on the Balkans*, 4: 900-910.

INTEGRALNA PROIZVODNJA VOĆA U BUGARSKOJ – NAJNOVIJA DOSTIGNUĆA, TENDENCIJE I EKOLOŠKI PRISTUPI PROIZVODNJI ZDRAVSTVENO BEZBEDNOG VOĆA

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Rezime

U ovom radu razmatraju se neki od najglavnijih elemenata integralne proizvodnje voća kao savremenog pristupa dobijanju ekološki čistog proizvoda vrhunskog kvaliteta – izbor odgovarajuće sorte i kombinacije sorta-podloga, integralni pristupi suzbijanju bolesti, štetočina i korova, sistemi navodnjavanja i održavanja površine zemljišta u voćnim zasadima. Kombinovani pristup suzbijanju štetočina, primena dobrih poljoprivrednih praksi i korišćenje pesticidnih preparata potvrđene selektivnosti, pogodnih za primenu u uslovima integralne proizvodnje voća, kao i pronalaženje alternativnih pristupa u cilju ograničavanja primene agrohemijskih – obezbeđuju dobre agrotehničke i ekološke uslove u ovoj proizvodnji. Integralna proizvodnja voća kao organizacioni oblik u voćarstvu primenjuje savremeni ekološki pristup voćarskoj proizvodnji. Znanje zasnovano na njenim osnovama neophodan je uslov za prilagođavanje voćarstva evropskim zahtevima u proizvodnji konkurentnog voćnog proizvoda i očuvanju životne sredine i biodiverziteta.

Ključne reči: voćarstvo, sorte, suzbijanje štetočina, integralna proizvodnja voća

