

RESEARCH ON THE TECHNOLOGY OF APPLE PLANTATION CROPS TO INCREASE THE QUALITY AND QUANTITY OF PRODUCTION

Sinziana Venera Morarita

Valahia University of Targoviste, Bdv Carol I, Nr 2, Romania

E-mail: cristi2morarita@yahoo.com

Abstract

To become competitive in domestic and European fruit quality domain it is necessary to apply technological measures, which consist of: tillage, fertilization, maintenance and fruiting pruning, irrigation, pest and disease control, but requires integration and generalization of some specific technological sequences into the technology of exploitation of orchards, leading to an increasing in quality and quantity of apples.

Keywords: quality, genetically resistant varieties, fertilization, irrigation, pest and disease control.

1. INTRODUCTION

Apple culture has experienced important changes in the world in terms of size and density of trees; from trees with tall, massive stature, planted at distances that require a range of very expensive machinery to run, to low branched and spaced planted trees that are currently coming into growers attention.

Over the years there has been a restructuring and modernization of horticulture, by switching from classical culture of trees with traditional character into intensive culture, and more recently into the super-intensive or high density.

In the culture of trees, regardless of planting system, we define a number of features defining indices and parameters for each system:

- yield and quality of fruit production per unit area in dynamics during the operation;
- land utilization expressed as the number of trees / ha by mp / or by tree planting distances;
- usage of biological material;
- the way of grouping trees together, crown driving, height and thickness of the trees;
- duration of exploitation operation;
- The investment and production costs;

Development of horticulture, is achieved by: use of new varieties, early dwarf rootstock of some of the physiological active substances, diversification of methods of driving of trees, agrotechnical measures according to modern technologies.

Technology now practiced in apple culture ensures high yields of stable and good storage. Growers know the elements which lead to diminishing vigor of the trees : early entry bearing, load standardization trees, foliar fertilization, watering systems, rules and techniques of cutting and integrated control of pests and diseases, crop protection against hail etc.

Understanding the need for change to increase quality and productivity level depends primarily on the awareness steps needed to be taken, as well as knowledge of the requirements of modern horticulture. Currently in preparation of a coherent program at the state level for the establishment of modern and efficient

orchards on larger surfaces. It is known that for revitalization of existing orchards and bringing them to an optimal level of production and quality there are required large sums of money, which private growers do not have. The program requires that in a relatively short amount of time, to create the conditions suitable for the formation of surface structures and method of their production.

Research is undertaken to enhance the quantity and quality of apple varieties with resistance to major diseases, to reduce production costs, to increase consumer and environmental protection. is necessary to apply. Optimal measures are needed to be applied, in the technology of obtaining organic apple production and they consist of:

- The tillage
- Fertilization
- Maintenance and fruiting cutting
- Irrigation
- Pest and disease control

A number of specific technology components have an important role in improving the quality and quantity of apple production, such as : chemical and manual fruit thinning and foliar fertilization, issues that were experienced during the addressed research and been materialized by obtaining the requisite market fruit size and uniformity of their size in the crown of trees. Using the experience of some apple varieties with genetic resistance to disease involves the definition of new concepts in order to establish differentiated making cuts to fruition, depending on the peculiarities of growth and fructification, and highlighting certain aspects of soil maintenance, the establishment of an integrated strategy to fight the weeds, diseases and pests.

In the current age the interest for a constant yearly production and quality by promoting the culture of apple varieties with genetic resistance to disease, is entitled, as the studies and research have focused on the following objectives:

1.Determining peculiarities of growth and fruiting of apple varieties with genetic resistance to disease studied

and currently share the propagation nurseries for orchards that are to be established;

2. Establishing of required parameters into the substantiation of technology to produce high quality apples, with minimal costs and reduced environmental pollution;

3. Establishing of a fair system of cutting trees, linked to maximizing the potential fruitfulness of apple varieties with genetic resistance to disease;

4. Knowledge of the degree of weed deepening in apple orchards and setting optimum timing for the application of herbicides, depending on the soil and their type;

5. Establishing optimal quantities of herbicides and weed control in apple orchards in doses with low environmental impact;

6. Establishing technological sequences of specific soil maintenance in apple orchards bearing, with special reference to the use of herbicides and weed in a biological manner;

7. Maintaining and improving soil characteristics, the contribution of herbs grown between rows;

8. Establishing a calendar, optimal timing and substances in integrated control of diseases and pests;

2. MATERIALS AND METHODS

The research was organized in Research and Development Station for Fruit Growing Voinești-Dâmbovița, aimed at increasing the quantity and quality of apples in some varieties with genetic resistance to disease and deepen some aspects of soil maintenance technology in apple orchards. Research undertaken on improving the quality and quantity of apples were materialized by highlighting specific biological features of apple varieties with genetic resistance to disease:

-Ciprian

-Florina

-Generous

-Pioneer

-Prima

-Voinea

To establish the peculiarities of growth of studied apple varieties the following measurements and determinations were undertaken :

- trunk circumference (cm);
- tree size (height and width) on the basis, determining the volume of crown mc / ha;
- branching angle, the total length of the scaffold and semi-skeleton;

- annual growth length;

To highlight the peculiarities of fruiting there were determined as follows:

- Degree of fruit bud differentiation;
- Degarnishing branches and semi-skeleton frame;
- Phenological phases of fruiting bodies;
- Degree of flowering and fruit binding;
- Registration fruit production and quality;

Cutting variants were organized in trees older than 12 years, planted at a distance of 4 / 2.0 m, free flattened shape of crown towards the direction of the line. At each

variety there were organized following the cutting of bearing fruit trees:

✓ V1 - ordinary cuts;

✓ V2 - Thinning the crown of trees with brief intervention on fruit configurations, eliminating some of the branches, rod, rod hearth when too dense;

✓ V3 - Thinning in detail on formations of fruit or disposal of surplus and fruit buds;

There were taken into account such 18 trees of each variety, having determined the thickness of the trunk and tree crown size. To determine the peculiarities of growth and fruiting on the same soils, development of buds placed on annual increases after shortening at different intensities, three trees of each variety had been determined. Were held four versions, with work on the branches of one year before the start of vegetation:

✓ V1 - without cutting

✓ V2 - shortening the upper 1/3

✓ V3 - shortening the length 1/2

✓ V4 - shortened to 1/3 of basal

Experimentation of foliar fertilizer, of chemical thinning and manual thinning to improve the quality of apples, apple varieties was made general and Florina. The trees were aged 12-15 years, planted at a distance of 4x3 m, free flat shaped crown along a row of trees.

We organized the following:

✓ V0 - untreated control

✓ V1 - chemical thinning

✓ V2 - manual thinning

✓ V3 - chemical, thinning manual control

✓ V4 - chemical, thinning, manual control, foliar fertilization

In order to deepen some aspects of determining soil maintenance technology in fruit tree apple orchard belonging to Voinești - Dâmbovița basin, the following were pursued:

a. Determination of weeding, soil seed reserve and effectiveness of herbicides in weed control in apple orchards;

b. Establish new methods of soil maintenance in apple orchards bearing;

c. Calculation of economic efficiency;

3. RESULTS AND DISCUSSION

Features of growth and fruiting of some apple soils with genetic resistance to disease.

Tree vigor is given quantitatively by vegetative growth on the amount accrued annual and is expressed through the trunk size, branches length and semi-skeleton frame, the length of annual increases. This is caused by the action of the soil and stock, as well as other factors, such as:

♣ The degree of soil fertility

♣ Planting distances

The most important criterion to be considered is the variety-rootstock combination, which directly influences the vigor of trees, entering of the fruit, production potential and life of the orchard.

The first apple varieties with genetic resistance to diseases introduced into crop varieties in Dâmbovița Basin were : Pioneer, Prima, Generous, Voinea.

Subsequently, the assortment diversified with Florina and Ciprian varieties. Differences in vigor of tree crown arise in the first 3-4 years of vegetation, variety and rootstock when influence is obvious. After 4-5 years of growth, the height of the trees is limited by the cutting operations and by reducing the rest period of vigor of growth, as a result of commencement of fructification. Data recorded on tree vigor apple varieties resistant to disease, studied at the age of 12, expressed in trunk circumference, total length of the scaffold and skeletal semi-angle branching, crown volume, highlight the following:

- trunk circumference was 34.5 cm and 43 between 9 cm, with an average annual increase of 1.4-1.9 cm higher values being attributed to vigorous apple varieties such as: Prima, Generous, Voinea, Florina;
- height by cutting the trees was maintained at values of 300-330 cm and 140-160 cm thickness at Orchard fence;
- angle branching, growth under natural conditions was 46-72 ° to the first floor, 45-67 ° on the second floor and 53-72 ° in the third floor.

Table 1. The vigor of growth of the trees at age 12

Variety	Trunk circumference (cm)		Tree dimensions (cm)		Crown volume (mc/ha)
	cm	Annual growth	Height	Thickness	
Ciprian	39,5	1,6	300	140	8.750
Generous	35,5	2,3	320	160	10.800
Florina	40,5	2,9	330	160	11.200
Pionier	34,5	1,4	310	150	9.750
Prima	43,9	1,8	320	150	10.100
Voinea	42,6	2,2	330	150	10.500

Based on data on tree growth vigor, it is necessary that the distance among varieties of fruit Prima, Generous, Voinea and Florina, be at least 3.5 cm and between Cyprian and Pioneer of 3.0 cm. Distance of 4.0 cm between rows is sufficient for normal growth of trees and shifting technological equipment to carry out the works, under the flattened open crown shape in the direction of the rows of fruit trees during fruiting phase. Regarding the distribution of fruit on the trees crown formations at the age of 10-12 years, there has been a slight shift towards the top of the crown fruit with a higher intensity to vigorous varieties.

From observations it appears that the lower part are on average 20-30% fruit formation, to the middle and upper formations where the percentage of fruit is divided almost equally. Therefore, from the age of 10-12 years, the disease-resistant varieties of apple large force, need to be taken to reduce the semi-cutting the skeleton, especially in the upper part of the crown, in such a way that the formations of the rod are evenly distributed throughout the orchard fence height.

From observations, it was found that degarnished areas often appear on vigorous crown varieties that are not

cut during entering the fruit. Florina apple varieties, Generous, Voinea, Prima, have during the first years of vegetative growth, exceeding the average 70-80 cm. In this case, if there is no intervention by the arching branches to enhance fruit bud differentiation, skeletal branches and semi-skeleton must be cut at least 1/3 of the length to cause further increases the garnishing with buds and fruit formation.

On the varieties that bear fruit on the branches, degarnished areas are almost non-existent due to the camber long branches, which distinguishes fruit buds and bends under the weight of fruit. Due to camber it decreases degarnishing of the skeleton and the semi-skeleton, because most of the buds start arched branches situated in vegetation and provides a rational and productive use, of the skeleton and semi-skeleton.

Economic efficiency of different methods of soil maintenance inside apple orchards

Increase fruit production efficiency requires increasing concerns for finding ways, means and solutions for saving human and material resources, for their high capitalization. Achieving production with low costs, primarily requires reducing specific consumption of materials, fuel and power.

Reducing material consumption have a direct influence on economic efficiency whereas, it becomes possible to obtain the same expenses of superior results.

A significant contribution to reducing production costs to a minimum sizing has a working capital, especially under current conditions. Production costs include apple culture in their structure and other expenses, such as depreciation, fixed assets and overheads, whose relative value is required to be minimized.

Big spending in apple culture were determined primarily by used technology, which is based on a high degree of mechanization of work, pest and disease control, harvesting the fruit, which is done in boxes, with the removal of rows and loading mechanized them.

To better understand the working method used, some clarifications are needed, namely:

- The actually worked surface for which determination was made is 3,360 square meters per hectars orchard of apple, with a working width of 1.5 m band;
- As a basis of comparison is used V1, now considered to be representative of horticulture and that is to plough on row, every 4-5 years and each year, hand work: a large hoe in spring and four during vegetation;
- Technical parameters relate to materials, labor consumption and consumption of mechanical work, ground maintenance on the row of trees;

The advantages of using herbicides among the row of trees do not stop at the economic, also offering a range of social benefits, labor productivity and work economy, while making it easy to work optimally. Manual maintenance on the soil row of trees require great volume of labor, is costly and due to climatic conditions or the lack of manpower in certain periods, works are not executed in optimal time.

4. CONCLUSIONS

- ◆ To obtain a certain level of production in certain climatic conditions, it is necessary to correct dosage of chemical fertilizers, both in terms of supply of soil nutrients and provide the necessary nutrients for growth and fruitfulness appropriate trees;
- ◆ To implement the optimal parameters of cutting during the fruiting of apple varieties with genetic resistance to disease, must take into account the specific elements of the peculiarities of fruitfulness and growth;
- ◆ To establish the most suitable strategy, herbicides and annual optimal dosage requires careful identification of weeds in the orchard;
- ◆ To promote the culture of apple varieties with genetic resistance to disease is the main factor in the concept of integrated combat disease control;
- ◆ Additional technological sequences that have a significant contribution to the quality of the apples, is the chemical and manual fruit thinning, foliar fertilization;
- ◆ By the application of specific sequence technology, operating costs increase, but they are recovered and even recorded with a higher profit than in terms of applying conventional technology;
- ◆ On the economic effects resulting from the promotion of apple varieties with genetic resistance to disease, plus the benefits of protecting the environment, rapid restoration of populations of natural predators and parasites and maintain fruit quality standard;

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