LIGHT INTERCEPTION INTO APPLE TREE IN DEPENDANCE OF PRUNING SYSTEM

REGIMUL DE LUMINĂ ÎN COROANA POMILOR DE MĂR ÎN DEPENDENȚĂ DE SISTEMA DE TĂIERE

BALAN V., ŞAGANEAN R.
The State Agrarian University of Moldova, Chisinau, Republic of Moldova

Abstract: *The test occurred in 2005 in the intensive apple orchard of the society of "Alfa - Nistru", the district of Soroca, Moldova Republic. The orchard was planted in 2000, in spring with grafted trees on the rootstock M9 of Pinova variety. The planting distance was of 3,5 x 1,2 m. The were investigated four pruning methods in drayed in the experiment. The obtained results shoved that the pruning system with the elimination of the branches aged of 4 years by pruning at the spigot, at the growing ring or at a young lateral branch improvers the light conditions of the trees crown and limits the presence less lighted zones.*

Key words: light interception, apple tree, pruning system.

Abstract: *Experienţa a fost fondată în anul 2005 în livada intensivă de măr a societăţii „Alfa-Nistru", raionul Soroca, Republica Moldova. Livada a fost planată în primăvara anului 2000 cu pomi altoiţi la masă pe portaltoiul M9 de soiul Pinova. Distanţa de plantare 3,5×1,2 m. În cadrul experienţei au fost cercetate patru sisteme de tăiere în uscat. Rezultatele obţinute au demonstrat că sistemul de tăiere cu eliminarea ramurilor în vârstă de patru ani prin tăierea la cep, la inelul de creştere sau la o ramură tânără laterală ameliorează regimul de lumină din coroana pomilor şi limitează prezenţa zonelor slab iluminate.*

Cuvinte cheie: regim de lumină, pom de măr, sistemă de tăiere.

INTRODUCTION

All pruning systems of trees aim to improve the quality and regularity of production. A key factor is the optimization of light interception in plantation. The pruning system trees affects the amount of solar energy received by the leaves. The light intensity increases once with increasing the volume of the crown of the tree. The main factors and determinations of the light are the shape and dimensions of the crown, the density and structure of the leaf area, affected by environmental conditions and technology applied gauge planting, pruning system etc. (*1, 2, 3, 5*).

MATERIAL AND METHOD

The tests were conducted in the orchard of the S.A. "Alfa-Nistru", district Soroca, Moldova Republic. The orchard was planted in 2000 at a spacing of 3,5 x 1,2 m with scions of 2 years. The trese are conducte as follows spindle slender type.

The rows were oriented N-S. The distribution of light was measured a variety Pinova at East, Central and West part of the crown, in bottom (1,0 m), middle (1,7 m) and high (2,4 m) of the surface soil. Measurements were made at the end of July, for a time clear, with abdelomètre M-69 and GSA-galvanometer to the base of the method described by V. Luk`anova and A. Denisov (1968).

The method of pruning as follows:

V 1 (control) - the elimination of the branches with the replacement cycle of 3-4 years; V 2 - the elimination of the branches of 3 years at a young lateral branch or at the growth ring;

V 3 - the elimination of the branches of 4 years at a young lateral branch or at the growth ring;

V 4 - the elimination of the branches of 3-4 years tangent to the bisector of the angle between the central axis of tree and axis of the branch removed.

The purpose of this study is to develop new methods wath improve the distribution of light in intensive orchards.

RESULTS AND DISCUSSIONS

The study of the light in the crown of the tree of the variety Pinova during the day, shows that the intensity of this indicator is conditioned by the intensity of incident solar radiation by the sun, the pruning etc. In vertical plane (fig. 1) the distribution of light at the base (1 m), middle (1,7 m) and at the top of the crown (2,4 m) increases once with the height of the surface soil, being in constant growth of 7^{00} morning hours (0,18 cal/cm2.min) till 13^{00} (0,56 cal/cm2.min), after that it is decreasing till 1900.

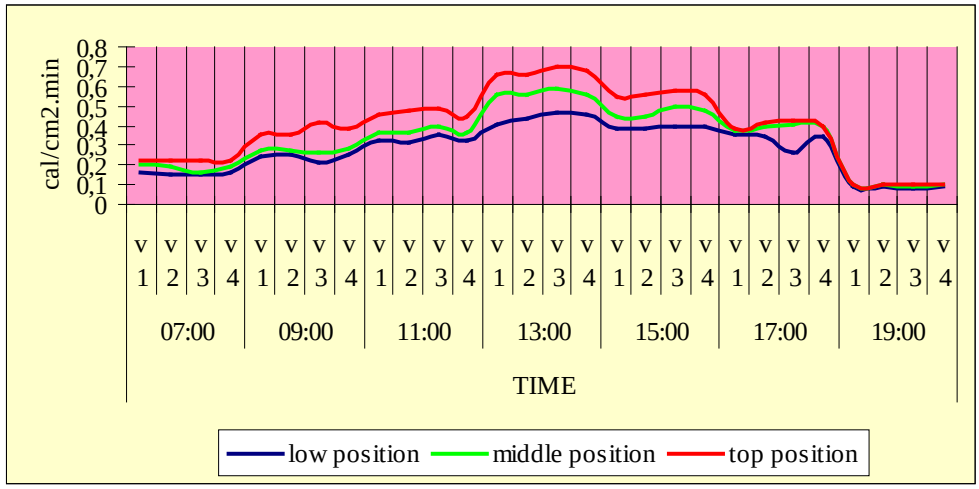

Fig. 1. Light penetration at 3 heights of Pinova apple tree in dependence of the pruning system

Among the three sectors of the crown, the top position (2,4 m) is in conditions of illumination more favorable throughout the day. In the middle of the crown enters a lower amount of light that to the top but greater than at the base of thecrown.

Because the orientation of rows of the plantation is North to South the amount of sunlight received by that portion of the East and West of the crown is different. So in the morning (7^{00}) until 13^{00}, once height of sun above horizon increases, the crown of trese receptions a larger quantity of sunlight, the more intensive illumination (0,21-0,61 cal/cm2.min) remaining is to be at the East (fig. 2).

Starting from 15^{00} the intensity of illumination of the West dominates (0,56 cal/cm2.min) as part of the East and gradually decreases up to 19^{00}. During that time illumination of the crown is following in descending order: East, Central, West.

In dependence of pruning system studies we see that the gain of light intercepted is greater in the plantation where the pruning system was based on the elimination of branches of 4 years at a young lateral branch or at the ring growth.

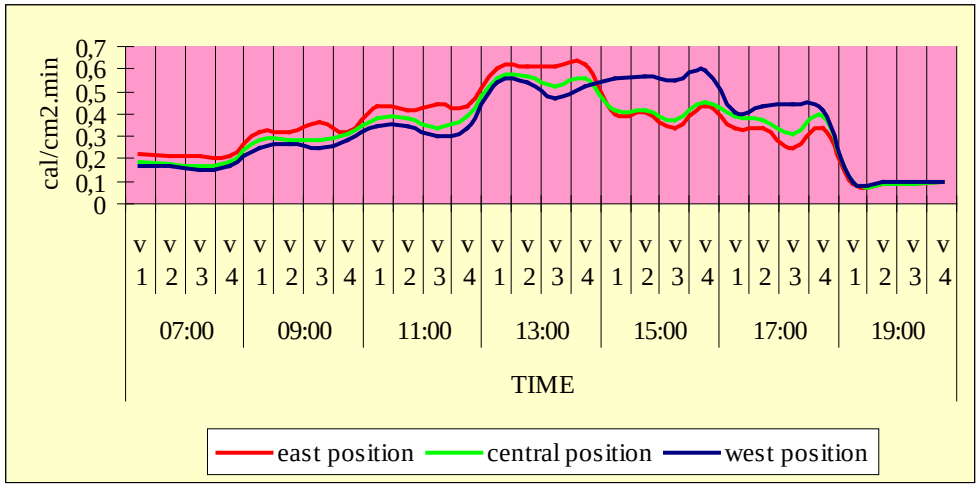

Fig. 2. Light penetration for 3 sides of Pinova apple tree in dependence of the pruning system

CONCLUSIONS

The light intercepted by the crown, at the bottom (1m) and middle (1,7 m) is quantitatively smaller than in top position of the tree (2,4 m), as in the first as well and during the second part of the day. The intensity of solar radiation is greatest until 13^{00} in the East (0,61 cal/cm^2.min), while from 15^{00} – in the West (0,56 cal/cm^2.min).

The pruning system with elimination of the branches of 4 years at a young lateral branch or at the growth ring improves the luminous atmosphere of a tree and limits the presence of low light zones.

REFERENCES

1. **Cimpoieş Gh., Boţan D., 2005** - *Regimul de lumină al coroanei în funcţie de structura plantaţiei.* Ştiinţa Agricolă, Chişinău, Nr. 1, p. 19–22.
2. **Henriot C., Monney Ph., Evequoz N., 2004** - *Réponse photosynthétique des feuilles de pommier a la lumière selon leur position dans la couronne et effet d`un ombrage induit*. Viticulture Arboriculture Horticulture, vol. 36 (1), p. 9-14.
3. **Jackson J., 1980** - *Light interception and utilisation by orchard systems.* Horticultural Reviews, p. 245-250.
4. **Luk`ânov V., Denisov A., 1968** - *Metodika opredeleniâ svetovogo rezima v кronah plodovyh derev`ev.* Sel`skohozâistvennaiâ bilogiâ, t. 3, Nr 4, p. 582-584.
5. **Şaganean R., 2009** - *Valorificarea potenţialului de rodire la măr în sistem intensiv prin aplicarea raţională a tăierii pomilor în condiţiile specifice zonei de nord.* Autoreferatul tezei de doctor în agricultură, Chişinău, 23 p.