

RATIONAL USE OF SOIL FERTILIZATION IN SUPERINTENSIVE SYSTEM OF APPLE TREES

UTILIZAREA RAȚIONALĂ A FERTILITĂȚII SOLULUI ÎN SISTEMUL SUPERINTENSIV DE CULTURĂ A MĂRULUI

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Abstract. *The investigations were made in the orchard of Ltd “Codru-ST”, „Rassvet” sector founded in 2000 with benchgraftings of Golden Reinders and Gala Must, grafted on M9 rootstock. There were studied the types of soil of the above mentioned sector, then it was calculated the productivity potential of the investigated soil and the real productivity obtained during the period of 2005-2007. It was established that the productivity potential of the land on which is located the apple tree superintensive plantation varies from 22 to 33 t/ha, according to the type of soil. In order to increase the yield to 35-40 t/ha of qualitative fruits, there were made some supplementary fertilizations with mineral material under the planted yield according to the level of soil supply. The average yield of fruit during the period of 2005-2007 was 25,81-39,37 t/ha for Golden Reinder’s and 30,45-46,15 t/ha for Gala Must.*

Rezumat. *Investigațiile au fost efectuate în livada SRL „Codru-ST” sectorul „Rassvet” fondată în anul 2000 cu altoiri la masă soiurile Golden Reinders și Gala Must altoite pe portaltoiul M9. S-au studiat tipurile de sol pe sectorul menționat, s-a calculat potențialul de productivitate a soiurilor investigate și productivitatea reală obținută în perioada anilor 2005-2007. S-a stabilit ca potențialul de productivitate a terenului pe care este amplasată plantația superintensivă de măr variază de la 22 până la 33 t/ha în funcție de tipul de sol. Pentru majorarea recoltei la 35-40 t/ha de fructe calitative s-a efectuat fertilizări suplimentare cu îngrășăminte minerale sub recolta planificată în funcție de nivelul de aprovizionare a solului. Recolta medie de fructe pe parcursul anilor 2005-2007 la soiul Golden Reinders a constituit 25,81-39,37 t/ha, iar la soiul Gala Must 30,45-46,15 t/ha.*

The mineral fertilization is less important to modern fruit growing. The fertility degree of the soil should periodical tested (every 1-3 years) by soil sampling and by a calculation of the nutritive balance and apply additional lime or other nutrients as needed (1,3,4).

Terminal growth and general vigor of individual trees should be observed closely. Where growth the past year was short, increase the amount of fertilizer slightly. If growth was excessive, reduce the rate. Fertilizer rates can be fine-tuned even further by sampling leaves for tissue analyses (2).

MATERIAL AND METHOD

The studies made in 2005-2007 in the superintensive apple tree orchard of the Ltd. “Codru-ST”, “Rassvet” sector planted in 2000 year with bench graftings of Golden Reinders and Gala Must varieties grafted on rootstock M 9. The distance of plantation is 4,0 x 1,0 m. The experiments included variants with different productivity potential of the soils as: diluvial

calcareous chernozem, weakly eroded calcareous chernozem and moderately eroded calcareous chernozem.

There were studied the types of soil of the above mentioned sector and then it was calculated the productivity potential of the investigated soil and the real productivity obtained during the period of 2005-2007.

The soil is seeded with grass at distances between the rows and the field is herbicided on the strips between the apple trees on the raw with a width of 1,2 m, the irrigation is through dripping.

The number of repetitions for each yield is 4. The number of apple trees in each repetition is 8. The place of repetitions is in blocks and of the evidence apple trees in each repetition is at randomize. Apple trees are lead after the structured axle system with the horizontalization of branches and shoots by their fixation with the help of support elements.

RESULTS AND DISCUSSIONS

It was established the content of humus (%) and N, P, K (ml/100 g of soil) in soil of 0-50 cm, 50-100 cm and 0-100 cm.

As a result it was calculated the potential productivity of the soil under the study and the supply with humidity for irrigation through dripping at a level not less than 75-80 % from the field capacity to retain water into the soil.

The diluvial calcareous chernozem which according of the actual classification, is considered relatively optimum assured with humus and have potential of productivity of 33,0 t/ha qualitative fruits (table 1).

Table 1

Content of humus and NPK in the soil, 2005-2006 years

Type of soil	Layer thickne ss, cm	Humus, t/ha	NO ₃ , kg/ha	P ₂ O ₅ , Kg/ha	K ₂ O , kg/ha	Potential of productivit y, t/ha
Diluvial calcareous chernozem	0-50	233,8	131,6	196,0	1890,0	33,0
	50-100	124,4	61,6	108,7	942,5	
	Sum	358,2	203,2	304,7	2832,5	
Weakly eroded calcareous chernozem	0-50	198,5	110,8	178,7	1787,0	28,0
	50-100	80,5	36,5	53,3	587,0	
	Sum	278,5	147,3	232,0	2374,0	
Moderately eroded calcareous chernozem	0-50	192,3	66,2	132,3	1102,1	22,0
	50-100	65,4	16,0	42,1	535,0	
	Sum	257,7	82,2	174,4	1637,1	

The weakly eroded calcareous chernozem is weakly assured with humus and NPK hat a potential of productivity of 28,0 t/ha and in the moderately eroded calcareous chernozem with a low level of supply with humus and NPK, have the potential of productivity of 22,0 t/ha

The calculation of manure doses under the planned yield in 2005-2007 of 35-40 t/ha, was made by the formula (2)

$$D=R \cdot C_{tf} \cdot K_s \cdot K_r - F \cdot K_i, \text{ where:}$$

D – the manure dose of a certain element (N, P, K), kg/ha;

R – planned harvest, t/ha;

C_{tf} – the consumption of certain element to from a tone of fruits;

K_s – index of dose correction of certain element according to the assurance level of the soil (table 2);

K_r – coefficient of return in the soil of the nutritive element (N, P, K) with leaves and other parts that go into the soil;

F – quantity of NPK manures introduced in the last years

K_i – coefficient of action of the certain elements in the next years (table 3).

Table 2

Correction coefficient of manures doses according to the level of soil assurance

Supply level	N	P ₂ O ₅	K ₂ O
Low	1,3	2,2	1,8
Moderate	1,1	1,9	1,4
Relatively optimum	1,0	1,4	1,0
High	0,9	0,9	0,8

Table 3

The coefficient of use of nutritive element from the manures introduced in the previous years

Year of action	Chemical fertilizers		
	N	P ₂ O ₅	K ₂ O
First	0,20	0,15	0,20
Second	0,10	0,10	0,15
Third	0,05	0,05	0,10

The result of manures application in calculated doses under the planned yield with a try in production (table 4), where it results that on the diluvial calcareous chernozem, assured relatively with humus and NPK, the average apple yield on 2005-2007 constitutes 39,37 t/ha Golden Reinders variety and 46,18 t/ha for Gala Must variety.

On weakly eroded calcareous chernozem, moderately assured with humus and NPK, the apple yield is about 17 % lower than that of the relatively optimum assured soil and is 34,59 t/ha for Golden Reinders variety and 38,46 t/ha for Gala Must variety.

Table 4

The fruit yield according to the soil proprieties, t/ha

Type of soil	Variety	2005	2006	2007	Average
Diluvial calcareous chernozem	Golden Reinders	42,80	41,01	31,27	39,37
	Gala Must	48,92	50,95	40,08	46,15
Weakly eroded calcareous chernozem	Golden Reinders	36,22	36,70	30,85	34,59
	Gala Must	40,70	43,50	31,20	38,46
Moderately eroded calcareous chernozem	Golden Reinders	28,45	27,27	21,72	25,81
	Gala Must	31,90	33,14	26,31	30,45

On moderately eroded calcareous chernozem, with a low level of supply with humus and NPK, the fruit yield is about 35 % smaller than that on of the relatively optimum assured and constitute 25,81 t/ha for Golden Reinders variety and 30,45 t/ha

for Gala Must variety.

The fruit quality for all the varieties under the study was mentioned at a high level due to the fruit manual thinning calculated on 1 cm² of the transversal section of the truck – 0,8 kg. The difference appeared in the qualitative categories by 75-80 % with a diameter of 70 – 75 mm extra on the first type of soil, 55 – 60 % on the second type of soil and 50 % on the third type of soil.

The most productive type of soil was diluvial calcareous chernozem where the average production of the Golden Reinders variety constitutes 39,37 t/ha and 46,15 t/ha for Gala Must variety. On weakly eroded calcareous chernozem the average production constitutes respectively 34,59 and 38,46 t/ha, but on moderately eroded calcareous chernozem this index is respectively 25,81 t/ha and 30,45 t/ha.

CONCLUSIONS

For the superintensive apple tree orchards, the most favorable soils are those with a deep non eroded profile, supplied at a relative optimum level with humus and NPK, where the average yield on many years reaches 40-46 t/ha with about 75-80 % of extra quality.

Favorable soil is the weakly eroded soil with a moderate level of supply with humus and NPK where the yield reaches to 35-38 t/ha with about 60 % extra qualitative fruits.

Less favorable are the moderately eroded soils with a low level of supply with humus and NPK where the yield reaches 25-30 t/ha and only 50 % high quality fruits.

The calculation of fertilizer doses under the planned yield according to the consumption of NPK per 1 tone of fruits, the assurance level of the soil with humus and similar forms to NPK, the recovery of these elements into the soil with the fallen leaves and other parts, the use of utilized fertilizers in recent years (1-4) contribute to the fertilizer consumption reduction per 1 tone of fruits with about 25-30% than the traditional recommendations that are not referring to each lot sector.

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