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**EFFECT OF THE CONSTRUCTIONS AND PLANTING PLANS ON THE
YIELD OF THE HAZELNUT CULTIVAR SVYATKOVY STANDARD
LAYERS IN A MOTHER PLANTATION FOR VEGETATIVE
REPRODUCTION**

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The author presents the results of studying the constructions and planting plans in a mother plantation for the hazelnut vegetative reproduction and has determined their effect on this crop (cultivar Svyatkovy) layers blade surface. It is a planting plan of 1.5 x 0.3 m that is the most efficient one for the vertical way of the reproduction and 1.5 x 0.4 m for the horizontal one. Those plans provide the highest yield of standard layers.

Hazelnut, constructions and planting plans, horizontal and vertical ways of reproduction, mother plantation, layers, blade surface.

Putting of the problem. Hazelnut (*Corylus maxima Mill.*, the orchard form of filbert) is one of the main nuciferous crops. It takes the third place in the world's production after almond and Persian walnut and provides a food product which is important for the human organism. Regrettably, its fruits internal proposition level does not meet the requirements of the country the annual consumption per capita is 0,10 kg while the world's one 1,86 kg. One of the reasons of the insufficient hazelnut cultivation spread in Ukraine is difficulty in the inland cultivars reproduction caused, on the one hand, by their absence in the «State Register of the Cultivars» and, on the other hand, by the considerable requirements in the planting stock and insufficient areas of basic mother-cutting plantations (3,5 ha) whereas the requirement is 7,5 ha [7].

Since hazelnut is cross-pollinated the signs of female plants are not preserved by the seed reproduction. Attaining the planting stock identical in full with the selected cultivars is provided by the vegetative reproduction: with layers

(horizontal, vertical, potted), division of a bush, rhizome sprouts, grafting and soft cutting [8]. The first of the mentioned ways is the most accessible and widely used one. It lies in the fact that one-two-year shoots are displanted and rooted without separating them from a female plant [1].

Displanting of horizontal layers. This way of reproduction which is also called “chinese” is recognized as one of the best in Italy and India where it was researched by M.Rosa at the Institute of Horticulture and Electric-Power Engineering (Rome) and R. Patrak at the Agricultural Research Centre (Chaubatiya) respectively [3, 6].

In the process of work young well-developed one-two-year shoots are used. In autumn or early in spring (before blooming of shoot buds) they are lain horizontally into a gutter and fastened with wooden hooks but not dusted. If near one bush there are very many shoots they are lain into specially prepared grounds with a size of 1.0-1.5 x 1.0-1.5 m and a depth of 10-12 cm. The lain shoots have at an average 15-20 vigour shoot buds each. The latters can develop vertical sprouts [9].

To grow horizontal layers it is possible to use bushes of any age with a sufficient amount of young shoots. It is one-year shoots 1.0-1.5 m long with a diameter of not less than 10 mm that develop the greatest amount of sprouts. By the beginning of June up to 10-20 shoots of the vertical sprouts are formed on each metre of the horizontally lain shoots. When the sprouts achieve a height of 15-20 cm (the end of May- beginning of June) their lower part (2/3 of the height) as well as the lain shoots are dusted with ground or a substrate consisting of ground and duff in a proportion of 1:1 [1, 9].

Vertical layers. American scientists state that it is the most perspective way of the hazelnut reproduction using sprouts which enables to obtain from the first year a plant with one trunk and fast root system that does not form a great amount of sprouts [1]. It is applied for the cultivars that develop many root shoots. The simplest way is to ridge a bush with a great amount of one-two-year shoots with ground or a substrate including ground and duff or peat not less than 2-3 times

during the vegetation period in order to form a ridge up to 25-30 cm high. In the middle of it shoots are rooted, in passing, by the autumn already if warmth and humidity combine favourably. In autumn the rooted shoots are dug out, separated from a female bush and brought to a nursery for the prolonged growing or planted on the constant place [5, 6].

The purpose of our researches was to determine high-efficient technique of the hazelnut vegetative reproduction with horizontal and vertical layers in a mother plantation different planting plans being used.

Methods. The investigations were carried out in the Ukraine's Right-Bank Lisosteppe, at the Institute of Horticulture (NAAS), in 2013-2014 in a mother plantation for the vegetative reproduction (planting of 2012). Cv Svyatkovy was studied. The soil in the patch is dark-grey podzolized. The climate is temperate continental. Ways of planting were vertical with planting plans of 1.5×0.3 m (control), 1.5×0.4 , 1.5×0.5 m, horizontal 1.5×0.4 (control), 1.5×0.5 , 1.5×0.75 m in a two-fold repetition (10 plants each).

The planting stock quality was determined according to the specification DSTU 4780:2007.

The blade surface and female bushes reproductivity were installed applying the methods of P.V. Kondratenko, M.O. Bublyk [4].

The mathematical analysis of the research data was conducted applying disperse method (B.O. Dospyekhov) [2] on a personal computer using the programme "Agrostat".

Results of the researches and their analysis. The female bushes reproductivity with the use of the vertical reproduction way was the greatest in the first year of the mother plantation exploitation, although not high—3.3 layers per 1 plant, the planting plan being 1.5×0.5 m, in three-year stands (2014) 5.9 layers (1.5×0.4 m). The average index of the cultivar Svyatkovy during the investigation years was the highest with the usage of a planting plan of 1.5×0.4 m—4.5 layers per a surface unit. The standard layers greatest yield in 2013 was registered while applying a planting plan of 1.5×0.5 m (30.6 thus. Plants per 1 ha), next year 74.1

layers per 1 ha (1.5×0.3 m, table 1) and on the average for the first two years of the mother plantation exploitation when the latter of the mentioned plans was used (49.6 thus. layers per 1 ha).

In 2013 the reproductivity of the mother plantation by the horizontal reproduction way was 10.8 and 10.7 plants per 1 linear metre if planting plans of 1.5×0.4 and 1.5×0.5 m respectively were applied and next year 24.7 and 23.8 layers (1.5×0.4 and 1.5×0.5 m). The lowest reproductivity for the both years was 8.6 and 6.9 plants respectively per 1 linear metre (1.5×0.75 m). The substantial difference as about the yield of standard layers per 1 ha was observed while using the mentioned reproduction way by different planting plans. The least difference was 25.1 thus. layers per 1 ha in 2013 (1.5×0.75 m) and 29.7 thus. in 2014 (table 1).

The increase of the hazelnut layers vegetative mass depends, first of all, on the blade surface. Its formation was influenced right by the constructions and planting plans of female plants in the patch. The obtained results concerning the plants yield per 1 ha testified in favour of the horizontal reproduction way because the more plants density in the mother plantation, was the less layer blade surface was but their summary surface per 1 ha rose (table 2) while by the vertical way the contrary phenomenon was observed. That could effect the layers thickness, above all. In 2013 the first of the mentioned indices was the lowest by the vertical reproduction way (the planting plan was 1.5×0.5 m) which caused the lowest layers yield per 1 ha (44.0 thus.) but provided the highest yield of the standard ones – 30.6 thus. per 1 ha. By the horizontal way the layers blade surface was also less when applying the greatest planting plan – 1.5×0.75 m (10.9 thus. m^2/ha) and the plants yield less (57.3 thus. layers/ha) in comparison with the control (72.0 thus. plants/ha), however, the yield of the standard ones appeared practically equal with the control variant by plans of 1.5×0.75 and 1.5×0.4 m – 25.1 and 27.4 thus. plants/ha respectively.

In 2014 by the vertical way of the reproduction the highest yield of the standard layers (74.1 thus. plants/ha) was observed while using a planting plan of

1.5 × 0.3 m as well as the biggest blade surface (24.6 thus. m² /ha). It should be noted that by a planting plan of 1.5 × 0.5 m the latter of those indices proved the lowest (17.8 thus. m² /ha) which caused the low layers yield (61.3 thus. plants/ha), among them standard ones 26.0 thus., that is almost by 2.5 less than the total amount was. By the horizontal way of the reproduction the blade surface was the biggest (38.1 thus. m² /ha) if a planting plan of 1.5 × 0.4 m was applied. That ensured the highest yield of standard layers – 127.6 thus. plants/ha. By a plan of 1.5 × 0.75 m these values (9.2 thus. m² /ha and 29.7 thus. layers/ha respectively) turned out less as compared to the control (38.1 thus. m² /ha and 127.6 thus. plants/ha, tables 1, 2).

1. *Reproductivity of the hazelnut cultivar Svyatkovy female bushes and yield of standard layers depending on the ways of reproduction and female plants planting plans (planting in 2012)*

Planting plan, m	Layers yield						Layers yield per 1 ha, % of the total amount (at an average for 2013-2014)
	2013			2014			
	per 1 female plant	total, thus. plants/ha	standard, thus. layers/ha	per 1 female plant	total, thus. plants/ha	standard, thus. layers/ha	
<i>Vertical way</i>							
1,5x0,3 M	2,2*	48,9	25,1	4,1*	91,1	74,1	70,9
1,5x0,4 M	3,1*	51,7	15,9	5,9*	98,3	57,7	49,1
1,5x0,5 M	3,3*	44,0	30,6	4,6*	61,3	26,0	53,8
LSD₀₅	0,53	-	3,06	0,61	-	0,63	-
<i>Horizontal way</i>							
1,5x0,4 M	10,8**	72,0	27,4	24,7**	164,7	127,6	65,5
1,5x0,5 M	10,7**	71,3	50,9	23,8**	158,7	102,4	66,7
1,5x0,75 M	8,6**	57,3	25,1	6,9**	46,0	29,7	53,0
LSD₀₅	0,70	-	1,21	0,76	-	1,37	-

Notes.* layers per 1 female plant, ** layers per 1 linear metre.

2. Blade surface of the hazelnut cultivar Svyatkovy layers depending on the female plants planting plans and ways of planting

Plan of experiment	Blade surface, cm ²		Blade surface of 1 layer, m ²		Blade surface of layers, thus.m ² /ha	
	2013	2014	2013	2014	2013	2014
Vertical way						
1,5x0,3 M	115,4	90,3	0,22	0,25	11,4	24,6
1,5x0,4 M	113,1	89,1	0,23	0,24	11,2	21,9
1,5x0,5 M	121,8	96,7	0,24	0,29	10,5	17,8
Horizontal way						
1,5x0,4 M	84,3	86,4	0,23	0,24	16,4	38,1
1,5x0,5 M	49,8	57,4	0,16	0,20	11,5	32,9
1,5x0,75 M	61,7	66,3	0,19	0,20	10,9	9,2

Conclusions. The conducted researches have shown that the horizontal way of the hazelnut layers growing increases the female plants power of the shoot formation in comparison with the vertical one. It contributed to the highest standard layers yield. The optimal planting plan by the vertical way of reproduction appeared that of 1.5 × 0.3 m. That provided a yield of 49.6 thus. standard layers/ha on the average of the investigation years and by the horizontal one a yield of 77.5 thus. plants/ha (1.5 × 0.4 m).

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