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THE INFLUENCE OF BIO-FERTILIZATION UPON PRODUCTION LEVEL OF SOME HARVESTED APPLE CULTURES (*Vf*) IN AN INTENSIVE SYSTEM IN THE SOUTH-EAST OF ROMANIA

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Abstract

Knowing the relationship between orchards and bio-fertilization practices is needed to develop new production systems which bring known benefits and those of economic nature. Bio-fertilization systems applied to varieties of apple (Malus domestica Borkh*.) Vf type are recommended in order to maximize profitability in the apple culture. The purposeof this study (2012-2013) was to calculate bio-fertilization influence on yield (t/ha) of apple varieties with genetic resistance to scab (Vf): 'Topaz', 'Redix', 'Rubinola', 'Goldrush' and economic indicators in the climate conditions of the Ilfov county. Experimental module was arranged by trifactorial type using the subdivided parcels method in three repetitions. At the base of the economical study the technological files of apple culture/ha was used, determining the following indicators: production costs (lei/ha), net profit (lei/ha) and net profit ratio(%). Significant increases ineconomic indicators between 10 and 20% resulted in the experimental variant Naturamin 7,5kg/ha.*

Key words*: biofertilization, apple varieties, economical indicators, yield.*

INTRODUCTION

In Romania, the apple (*Malus domestica* Borkh.) has among other tree cultures, a leading position in terms of production and harvested areas. Because of the economical and nutritional importance the apple culture will maintain an important continuous place in the tree sector of our country. The results of research in tree domain was performed with a duration of a couple of years, this has shown the decisive influence of pedoclimatical conditions and culture technologies upon the apple production and implicitly economical efficiency. Regarding obtaining a economically profitable culture, rigours zoning must be impided on new apple varieties of *Vf* type according to the type of soil, climatic resources and their genetic needs.

In the areas with precipitation the evident efficiency of released production is shown and once with the increase in the mechanized grade and fertilization, economical spendings rise as well.

Numerous researches have shown a positive relation between genetic quality of the varieties used and technological works applied, all of these increasing the chance of growth in productivity and implicitly the economical efficiency (Țiu J.V. and colab., 2014).

Establishing the plane for technical economical activity supposed the early establishing of a specific document among which the technological file holds an important role (Merce and colab., 2000).

MATERIALS AND METHODS

The experiences had the purpose of determining the productivity of varieties taken in study with conditions of biofertilization and establishing economical efficiency for the apple culture of *Vf* type. To establish optimal technologically growth of profit, variant realized spendings were calculated for entire culture and released profit, on different hydric regime and numerous varieties *Vf* type. Observations and determinations were performed in 2012-2013 at Didactical Farm Station Belciugatele, didactical farm Moara Domneasca, with the following experimental factors: A - irrigation: a1 - unirrigated, a2 -

irrigated 2 l/h, a3 - irrigated 4 l/h; B - biofertilization: b1 – unfertilized, b2 – fertilized Naturamin 3,75 kg/ha, b3 – fertilized Naturamin 7,5 kg/ha; C - variety: c1 – Topaz, c2 – Rubinola, c3 – Goldrush.

The period of irrigation application was established by following a hydric graphic in the period of maximal requirement for plants and according to the active humidity index (AHI). The fertilizers were applied 4 times: immediately after blossom and every 3 weeks after. The biofertilizant Naturamin is a latest generation fertilizer with 80% free aminoacids with the role for biostimulation of growth and plant development in all phases, compatible with most fertilizers and pesticides and contributing to the growth and quality of production. The experimental module was of trifactorial type, arranged after the subdivide parcels method in three repetitions. Specific data of economical efficiency were calculated: cost production, income and profit rate.

RESULTS AND DISCUSSIONS

Analizing the index of economical efficiency in 2012 for the apple culture, every factor was took into the study, income was higher than the expenses related in the cultures maintenance.

As such the data from table 1 shows, that the variants less profitable from an economical point of view were irrigated variant 4l/h + unfertilized (a3b1) for Topaz *Vf* and Rubinola *Vf* and unirrigated + unfertilized variant (a1b1) for Goldrush *Vf* (Table 1).

With the highest procent of profit rate was obtained in the fertilizer with Naturamin 7,5 kg/ha + irrigated 2 l/h (a2b3) for all variants took into study, recording percentage of 59,3% of Topaz *Vf*, 56,81% of Goldrush *Vf* and 57,23% of Rubinola *Vf* varieties. Of irrigated 4 l/h+ biofertilized with Naturamin 7,5 kg/ha variant (a3b3), satisfactory percentages were released between 44,94% (Rubinola *Vf*), 49,57% (Topaz *Vf*) and 56,64% (Goldrush *Vf*) (Table 1).

Table 1. Economic efficiency of apples productions in 2012

Hydric regime	Fertilizer level	Production (kg/ha)	Production value (lei/ha)	Costs (lei/ha)	Profit (lei/ha)	Profit rate (%)
Topaz *Vf*						
a1(unirrigated)	b1	10.986,00	13.183,20	5.874,00	7.309,20	55,44
	b2	12.144,00	14.572,80	6.286,00	8.286,80	56,86
	b3	13.564,00	16.276,80	6.866,00	9.410,80	57,82
a2 (irrigated 2l/h)	b1	11.867,00	14.240,40	5.862,00	8.378,40	58,84
	b2	13.144,00	15.772,80	7.341,00	8.431,80	53,46
	b3	16.235,00	19.482,00	7.930,00	11.552,00	59,30
a3(irrigated 4l/h)	b1	12.130,00	14.556,00	8.188,00	6.368,00	43,75
	b2	13.950,00	16.740,00	8.477,00	8.263,00	49,36
	b3	14.864,00	17.836,80	8.995,00	8.841,80	49,57
Goldrush *Vf*						
a1(unirrigated)	b1	10.762,00	12.914,40	5.860,00	7.054,40	54,62
	b2	13.350,00	16.020,00	6.840,00	9.180,00	57,30
	b3	13.782,00	16.538,40	7.290,00	9.248,40	55,92
a2 (irrigated 2l/h)	b1	11.998,00	14.397,60	6.220,00	8.177,60	56,80
	b2	14.016,00	16.819,20	7.532,00	9.287,20	55,22
	b3	15.840,00	19.008,00	8.210,00	10.798,00	56,81
a3(irrigated 4l/h)	b1	15.120,00	18.144,00	7.998,00	10.146,00	55,92
	b2	14.872,00	17.846,40	7.990,00	9.856,40	55,23
	b3	15.980,00	19.176,00	8.315,00	10.861,00	56,64
Rubinola *Vf*						
a1(unirrigated)	b1	10.097,00	12.116,40	5.887,00	6.229,40	51,41
	b2	11.363,00	13.635,60	6.670,00	6.965,60	51,08
	b3	12.674,00	15.208,80	6.950,00	8.258,80	54,30
a2 (irrigated 2l/h)	b1	11.876,00	14.251,20	7.120,00	7.131,20	50,04
	b2	12.849,00	15.418,80	7.440,00	7.978,80	51,75
	b3	15.433,00	18.519,60	7.920,00	10.599,60	57,23
a3(irrigated 4l/h)	b1	11.870,00	14.244,00	7.995,00	6.249,00	43,87
	b2	12.863,00	15.435,60	8.380,00	7.055,60	45,71
	b3	13.562,00	16.274,40	8.960,00	7.314,40	44,94

In 2013 at the apple culture in all the variants studied, income was higher than expenses related in culture maintenance.

The table 2 shows that the least profitable variants were the once from irrigation 4 litri/h + unfertilized variant (a3b1) at Topaz *Vf* (43,46%) and Rubinola *Vf* (43,87%) and Goldrush *Vf* from irrigated 4 l/h + fertilized with Naturamin 3,75 kg/ha variant (55,37%) (a3b2).

The highest procentage of profitability rate (%) were obtained in the irrigated 2 l/h + fertilized with Naturamin 7,5 kg/ha variant (a2b3) for all varieties studied and performed values of 59,23% of Topaz *Vf*, 55,52% of Rubinola *Vf*, respectively 57,76 % of Goldrush *Vf*. At the same experimental variants was achieved satisfactory income (lei/ha) between 9760 and 12088 lei/ha (Table 2).

Table 2. Economic efficiency of apples productions in 2012

Hydric regime	Fertilizer level	Production (kg/ha)	Production value (lei/ha)	Costs (lei/ha)	Profit (lei/ha)	Profit rate (%)
Topaz *Vf*						
a1 (unirrigated)	b1	10.468,00	12.561,60	5.645,00	6.916,60	55,06
	b2	11.744,00	14.092,80	6.229,00	7.863,80	55,80
	b3	12.564,00	15.076,80	6.997,00	8.079,80	53,59
a2 (irrigated 2l/h)	b1	11.167,00	13.400,40	5.839,00	7.561,40	56,43
	b2	13.144,00	15.772,80	7.210,00	8.562,80	54,29
	b3	16.120,00	19.344,00	7.886,00	11.458,00	59,23
a3 (irrigated 4l/h)	b1	12.130,00	14.556,00	8.230,00	6.326,00	43,46
	b2	13.950,00	16.740,00	8.554,00	8.186,00	48,90
	b3	14.864,00	17.836,80	8.875,00	8.961,80	50,24
Goldrush *Vf*						
a1 (unirrigated)	b1	11.890,00	14.268,00	6.210,00	8.058,00	56,48
	b2	13.350,00	16.020,00	6.834,00	9.186,00	57,34
	b3	13.934,00	16.720,80	7.218,00	9.502,80	56,83
a2 (irrigated 2l/h)	b1	11.998,00	14.397,60	6.322,00	8.075,60	56,09
	b2	14.016,00	16.819,20	7.464,00	9.355,20	55,62
	b3	17.440,00	20.928,00	8.840,00	12.088,00	57,76
a3 (irrigated 4l/h)	b1	15.120,00	18.144,00	7.886,00	10.258,00	56,54
	b2	14.872,00	17.846,40	7.964,00	9.882,40	55,37
	b3	15.980,00	19.176,00	8.170,00	11.006,00	57,39
Rubinola *Vf*						
a1 (unirrigated)	b1	11.737,00	14.084,40	6.272,00	7.812,40	55,47
	b2	11.363,00	13.635,60	6.430,00	7.205,60	52,84
	b3	11.774,00	14.128,80	6.860,00	7.268,80	51,45
a2 (irrigated 2l/h)	b1	11.876,00	14.251,20	6.990,00	7.261,20	50,95
	b2	12.849,00	15.418,80	7.410,00	8.008,80	51,94
	b3	14.650,00	17.580,00	7.820,00	9.760,00	55,52
a3(irrigated 4l/h)	b1	11.870,00	14.244,00	7.995,00	6.249,00	43,87
	b2	12.863,00	15.435,60	8.268,00	7.167,60	46,44
	b3	13.562,00	16.274,40	8.797,00	7.477,40	45,95

Analizing the profit rate for the applied experimental factors it has concluted that in both studied years, the Topaz *Vf* and for the Rubiola *Vf* varieties, the lowest profit was irrigated 4 l/h + unfertilized (a3b1) and máximum profit was recorded in all three varieties for irrigated 2l/h + fertilized 7,5 kg/ha variant (a2b3) as well as the experimental variant.

The minimal profit for Goldrush variety was unirrigated + unfertilized (a1b1) in 2012a nd irrigated 4 l/h + fertilized 3,5 kg/ha in 2013 year. It can be concluded that values between the minimal and maximal profit between the years, the smallest differences were situated between 54,62% (2012 – a1b1) and 57,76% (2013 - a2b3) (Figure1).

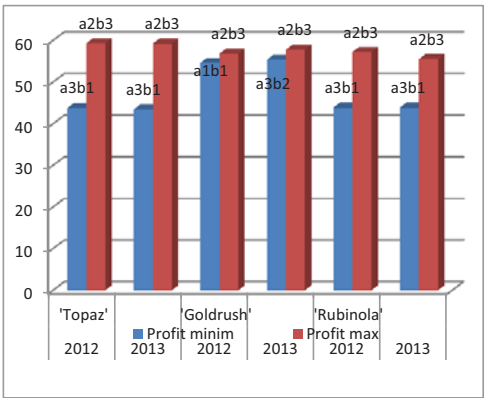

Figure 1. Experimental variants with minimal and maximal profit

CONCLUSIONS

❖ In the unfavourable climatic conditions specific for the 2012 year, technology for the apple culture regarding studied variants depended on the application of punctual irrigation at the trees root and application of four treatments with Naturamin biofertlizant products in doses of 3.75 kg/ha, respectively 7.5 kg/ha, respecting the phenophases of wetting application shown in the wetting graphic.

❖ In normal climatic conditions similar to 2013, technology for the apple culture regarding studied variants depended on the wetting application in critical phenophases and application of biofertilizing products.

❖ The high economical results were recorded due to a high level of production as a following of the influence of favourable climatical condition of 2013 in the technological links used.

❖ Maximum profit was recorded in all three studied varieties in the irrigated 2 l/h + fertilized with Naturamin 7.5 kg/ha variants (a2b3) and minimum profit for the irrigation 4l/h + unfertilized variants (a3b1).

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