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BEHAVIOR OF DIFFERENT POTATO VARIETIES ON SEED PRODUCTION PROCESS, USING OF DIFFERENT CULTURE SUBSTRATES ON GREENHOUSE

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ABSTRACT. Potato seed production represents a major interest of scientific research for this culture. Hydroponic system offers possibilities of production minitubers, with a superior sanitary quality. During the year 2009, the varieties Ostara, Christian, Roclas were experimented at National Institute of Research and Development for Potato and Sugar Beet Brasov on this system, comparative with classical technology on culture in greenhouse, using as biological material minitubers and plantlets. Analyzing the behavior of this varieties on different sublayers culture (expanded clay granules, perlite, soil), resulted a difference between experimented varieties and sublayers used. Christian and Ostara varieties have been registered the best results, concerning the minitubers number/plant, with values between 6.5 and 7.66 minitubers/plant. Using of hydroponic system had a positive influence on the minitubers number/plant, comparative with classical method of culture in greenhouse, on soil. This had been reflected by production of a big number of minitubers/plant, on the sublayer with expanded clay (8.25 minitubers/plant), followed by the sublayer with perlit (6.41 minitubers/plant). From view point of interaction between varieties and culture sublayer, concerning minitubers number/plant, the highest values were find at Ostara varieties on sublayer with expanded clay granules (10.5 minitubers/plant), followed by Christian on sublayer with perlit (9.5 minitubers/plant. Regarding the minitubers distribution on calibration class, the highest frequency of minitubers production is on calibration class 15-25 mm (for 9 cases), followed by calibration class <15 mm (8 cases). At calibration class 35-45 mm, production rate is very small (discovering only at Ostara variety in 3 cases). The influence of sublayer culture on size order of minitubers is reflecting by appearance of all calibration classes for the 3 sublayers, but with preponderance , the highest values are finding al 15-25 mm calibration class with a sum up value of 7.4 minitubers and 7.2 minitubers for calibration class <15 mm. Regarding the total weight of minitubers obtained/ plant , analyzed in function of sublayer, it may be note the positive influence of sublayers with expanded clay granules and perlite, used on hydroponic system, towards the soil, used in classical technology, the values being close between the two kinds of industrial sublayer (values with 34.27 and 33.27 g).

Keywords: minitubers, sublayer, nutritive solution, hydroponic system, calibration class

INTRODUCTION

Today, the soilless cultures represent a peak reality of very performant technology, which won a first position in vegetal production of world agriculture (Atanasiu, 2007). The fertilization of soilless cultures needs different manners of work and mineral inert sublayers can be take from nature or can be fabricate by industrial processing of working materials (Atanasiu,2007). Hydroponic system present next advantages: the sublayer allows a good rising of plants, the sublayer may be used by sterilization, the tubers don't present traces of suffocation, the administration and the composition of nutritive solutions may be automated. The use of hydroponic systems offers an excellent alternative to reduce the potential risks of root and tuber contamination by the soil pathogens and also for eliminating the need of chemical disinfectants, generally very harmful to the human health and environment (Medeiros and colab., 2001; Pereira and Fortes, 2003). Mini-and micro-tubers, obtained via biotechnological technique, represents excellent pre-basic seeds since they are diseases free, present excellent physiological characteristics and exhibit higher multiplication rates compared with tubers produced in field. The number of multiplication needed in the field, can be significantly reduced if mini, or micro-tubers are used (Struik and Lommen, 1990). The main problem in conventional seed production program is the low rate of multiplication of potato grown in potato field and susceptibility to disease, which can be transmitted through potato tubers. Multiplication of potato in each field, the risk of infection with viruses, bacteria or other pathogens increase (Ranalli and colab., 1994). Our researches have as objective, in the frame of this study: obtaining of minitubers necessary on seed production, by using industrial sublayer. We propose to define the methodology of minitubers obtaining, necessary on

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seed production, at National Institute of Research and Development for Potato and Sugar Beet Brasov, starting from researching over hydroponic system, by using industrial sublayer. The principal objective was to respond to the next questions: - which is the best sublayer culture for obtain the biggest number of minitubers?; - in what measure the biologic material - used at planting (vitroplants and minitubers) influences the number of obtained minitubers?; - which variety is better adapted at hydroponic system for minitubers production? ; - in what measure the type of sublayer and variety, influence the number of minitubers obtained on different classes of calibration?; - if there are significant differences between the studied variants, construed by the method of multiple corporations (Duncan test)?

MATERIALS AND METHODS

The experimental material contains vitroplants and minitubers from 3 varieties, classified on group with different precocity: Ostara variety (early), Christian and Roclas varieties (semi-early). The experience was placed in greenhouse, on hydroponic system and on soil, and the harvesting was made at the physiologic maturity of varieties. It was adapted technologies for soilless cultures, for hydroponic system, and for culture in greenhouse, with soil sublayer.

The solution from hydroponic system contained the three basis elements: nitrogen, phosphorus and potassium for the first period of vegetation (with a bigger concentration of nitrogen), and for the second period of vegetation, the composition NPK, was change in phosphor favor, using solutions with bigger concentration of phosphor. The nutritive solution was prepared on strength of soluble fertilizer Universol. In this paper, we present the partial results of the three varieties, on three sublayers cultures. The results are referring to: number of minitubers/plants obtains per variety, different sublayers and different calibration class; total weight of minitubers obtain/plant.

RESULTS AND DISCUSSIONS

From the analysis of partial date referring of minitubers obtaing/plant in function of biologic material used at planting, result that the three sublayers has a different influence over this.

From analyze of partial date concerning of minitubers/plant, in function of sublayers, results that the three types of sublayers had a different influence, the biggest numer of minitubers/plant, was on expanded clay granules sublayer, followed by perlite (figure1).

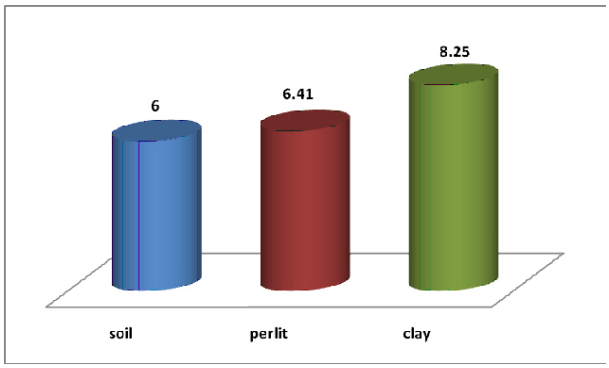

Fig. 1 The sublayer effect over minituber developing / plant

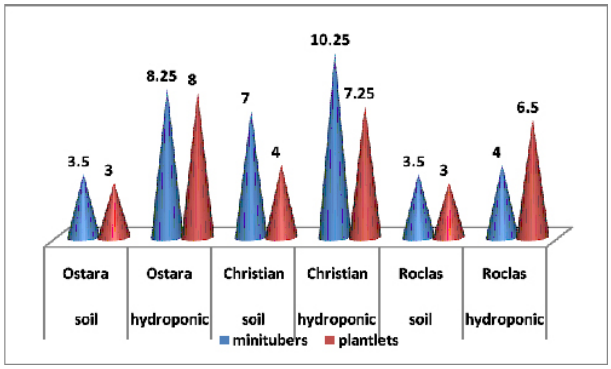

Fig. 2 The behavior of potato varieties concerning minitubers number / plant, in function of technology used

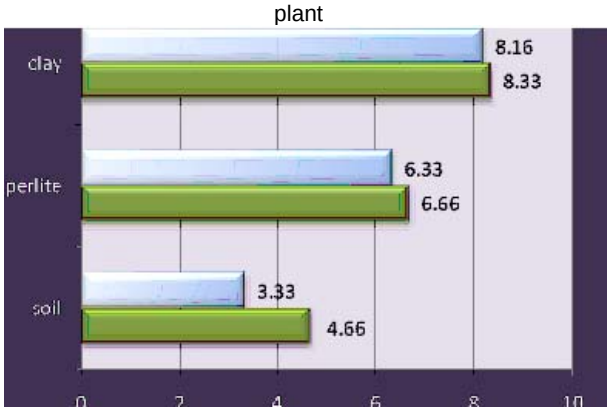

Fig. 3 The variation of minitubers number / sublayer in function of biological material planted

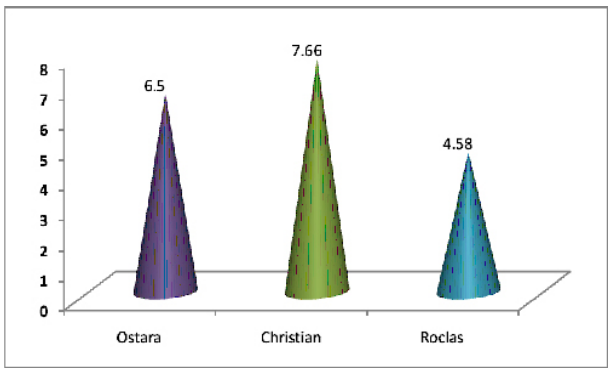

Fig. 4 Variation of minituber number/plant in function of variety

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Using of hydroponic system on minitubers production, beside the classic technology, indicate superior values for minitubers planting, as much as using plantlets as a biologic material, for all tested varieties (figure2). From figure 3, results that the biggest number of minitubers/plant is realized on variants with sublayers on expanded clay granules, for minitubers and vitroplants as biological material used at planting (8.33 and 8.16 minitubers). Between perlite and soil used the best results are obtained on perlite, both for minitubers and plantlets, acquiring 6.66 and respectively 6.33 minitubers, resulting with 2 and 3 minitubers more at using perlit in comparation with soil. Regarding the minitubers number, the three varieties had a different production; the Christian variety is more evident, with an average capacity of production by 7.66 minitubers, followed by Ostara variety (6.5 minitubers) figure 4.

From statistical analyses, the obtain results of the three varieties, construe by Duncan test, results the semnificative difference between Christian and Roclas varieties, concerning the minituber number/plant.

Table 1

Variety	Number of minituber/plant	Duncan test
Ostara	6.5	a
Christian	7.66	a
Roclas	4.58	b

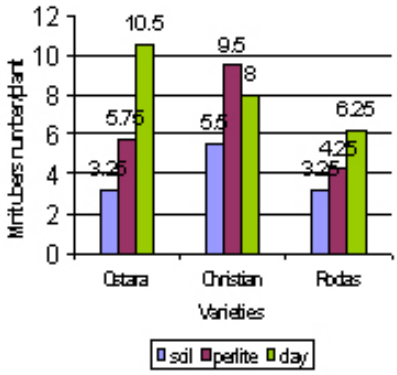

Fig. 5 Minitubers number variation in function of variety and sublayer

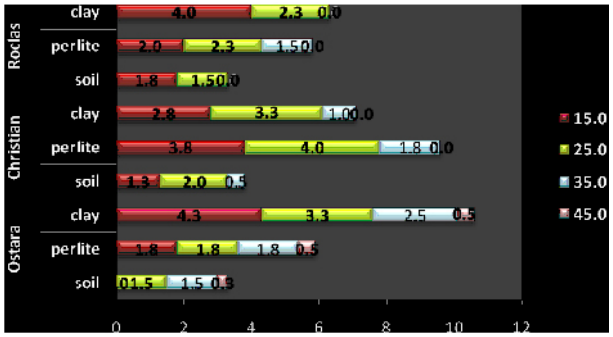

Fig. 6 Minitubers number variation in function of calibre, variety and sublayer

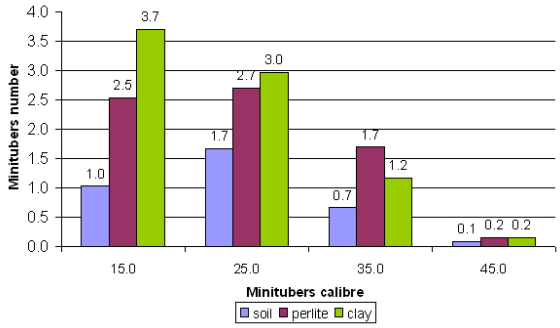

Fig. 7 Variation of minituber number on different sublayer, in function of calibre

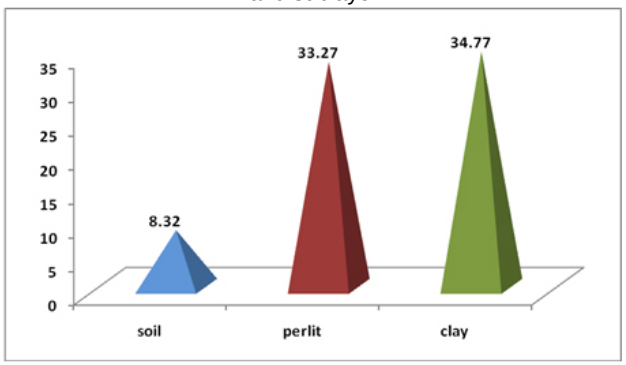

Fig. 8 The effect of sublayer over total weight of minitubers / plant

We may ascertain that the best production is obtaining at Ostara variety (10.5 minitubers / plant) and Chrstian, using as sublayer expanded clay granules. On perlite, the best production was recording at Christian variety (9.5 minitubers), followed by Ostara variety (5.5 minitubers/plant). The soil on the three varieties don't present a very strong influence, as the two sublayers cultures, the minitubers production, placing between 3.25 minitubers (Ostara and Roclas varieties) and 5.5 minitubers (Christian). This value is equal with the one obtain at Ostara variety, on perlit and superior to Roclas variety, on the same sublayer-perlite (figure 5). Concerning the capacity of three varieties, using sublayer cultures specified, of producing minitubers from different calibration class (figure 6), we may establish a big variation of these. Ostara variety, early variety differentiate by the absence of calibration class of size <15 mm, on soil sublayer. Instead it was found minitubers of 35-45 mm size on all three sublayers, at a sub-unitary average (0.3-0.5 minitubers).

Obtained data for Ostara variety confirms the earliness of this, comparing with the two varieties

classified on group of semi-early varieties. Ostara variety reacts better on expanded clay granules, inducing tubers from all three class of variation, from which at class <15 mm it obtain the biggest value (4.3 minitubers). Christian variety produces minitubers from classes <15.15-25.25-35 mm, on three sublayers culture, reacting better on perlite. Expanded clay granules had a favorable effect over minitubers number/plant with superior values of that obtained on soil. Roclas variety, presented an equal number in value of minitubers from class <15 mm (1.8 minitubers / plant) with those obtain from Christian, but on perlite. Besides, on perlite we are registering minitubers from the three classes <15, 15-25 and 25-35 mm with medium value from 1.5 to 2.3 minitubers/plant. On expanded clay granules sublayer it obtained at Roclas variety, minitubers from <15.15-25 classes with an average of 4.0 and 2.3 minitubers/plant.

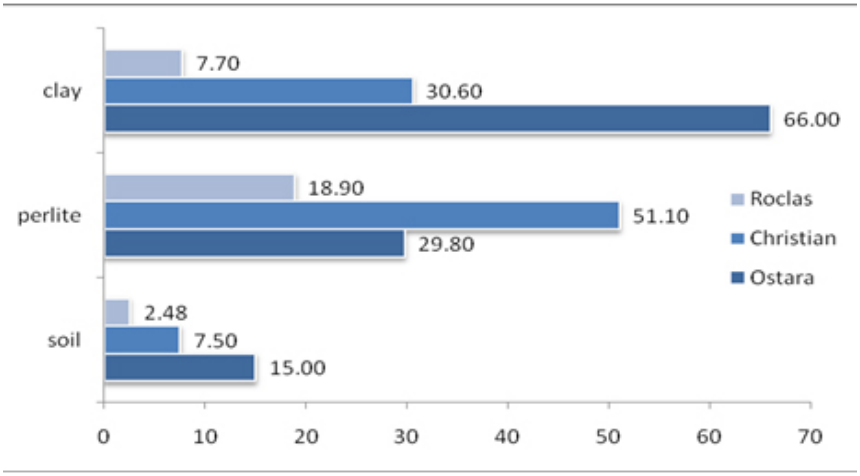

Fig. 9 The variation of minitubers total weight/plant in function of sublayer and variety

Fig. 10 Plants on expanded clay granules

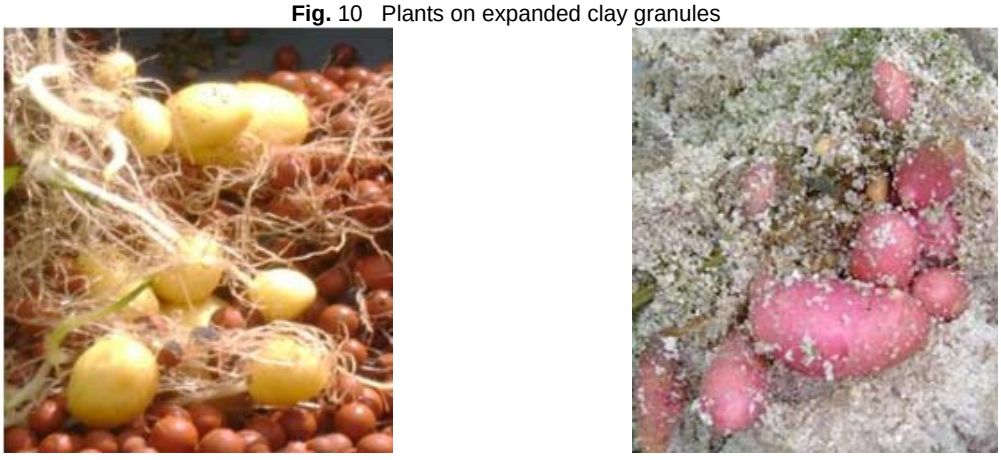

Fig. 11 Minitubers on expanded clay granules and perlite

Analyzing the number of minitubers on three types of sublayers, on four calibration class, we established that there weren't tubers bigger than 45 mm (figure 7). Prevalent is the class with tuber of 25 mm size, followed by <15 class, with adding up values of 7.4 minitubers /plant and 7.2 on the three sublayers. The lowest number of minitubers was at 35-45 mm class, the value of this being sub-unitary.

We may conclude, concerning the total weight of minitubers obtain/plant (analyzed in function of sublayer), the positive influence of expanded clay granules and perlite, on hydroponic system, besides of soil sublayer, the values being close between industrial sublayers and bigger in compassion with soil (fig.8). The total weight of minitubers/plant is influenced by variety and sublayer, Ostara variety presenting the bigger total weight of minitubers (66g) on expanded clay granules, followed by Christian variety, on perlit sublayer (51.1g).

Roclas variety cultivated on perlite, present a total weight of minitubers/plant (18.9), bigger than three varieties on soil (15;7.5;2.48) and same variety, cultivated on expanded clay granules (7.7g) (figure 9).

CONCLUSIONS

The varieties Chrstian and Ostara presented the best results regarding the minitubers number obtain/plant, with value of 7.66 and respectively 6.5 minitubers/plant. Using of hydroponic system had a poisitive influence over the number of minitubers/plant, comparative with classic method of culture in greenhouse, on soil, reflected by obtaining of a bigger number by minitubers/plant, on sublayer with expanded clay granules (8.25 minitubers/plant), followed by perlite sublayer (6.41 minitubers/plant) and soil (4 minitubers/plant).

From view point of interaction variety x culture sublayer, on minituber number/plant, the highest values are finding at Ostara variety on expanded clay granules sublayer -10.5 minitubers/plant, followed by Christian variety, on perlit sublayer (9.5 minitubers/plant). Concerning the capacity of the three varieties of producing minitubers from different calibration class, on the three sublayers, it may be conclude, that the size of minitubers didn't exceed 45 mm, predominant being the size class 15-25 mm. followed by <15 mm class, for all varieties and used sublayers. Roclas variety wasn't rediscover, on soil and expanded clay granules at 25-35 mm class, and Ostara variety produced minitubers also from 35-45 mm, on all three sublayers, but at sub-unitary values.

Regarding the total weight of minitubers obtain per plant, analyzed in function of sublayer, we may establish, that this present value approach to expanded clay granules and perlite: 34.77g and respectively 33.27 g. Analyzed in function of varieties and sublayers, the total weight presents differentiated values. The obtained results, statistical construed by Duncan test, denote significant difference regarding the minitubers number obtain/plant at Christian and Ostara variety, besides Roclas. Using of hydroponic system on minitubers production, besides classic technology, denote superior values of number and total weight of those, for all tested varieties.

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