A case study on current potato (*Solanum tuberosum* L.) minitubers production in Latvia and its further prospects

Ilze Dimante[1,2], Zaiga Gaile[1]

[1] Latvia University of Agriculture, Liela iela 2, Jelgava, Latvia

[2] State Priekuli Plant Breeding Institute, Zinatnes 1A, Priekuli, Latvia

Ilze.Dimante@priekuliselekcija.lv

INTRODUCTION

As a vegetatively propagated field crop, potato is prone to accumulation and further spread of several diseases influencing its yield and quality. Potato (*Solanum tuberosum* L) seed production in Latvia is considerably affected by potato viruses infections caused by severe pressure of viruses transmitting vectors. In the second part of the 20th century some popular local varieties were 100% infected by viruses and were excluded from potato seed production system.

In 60-ies studies on virus elimination methods were started in Latvia, followed by establishing of in vitro collection of potato varieties and breeding material.

Potato seed production system based on virus free in vitro plant micropropagation material was established at State Priekuli Plant Breeding institute (SPPBI), Latvia in 80-ies of 20th century. Propagation included elimination of potato viruses , aseptic culture establishment, plant micropropagation and minitubers (initial seed material) growing in glasshouses and plastic tunnels.

Wiersema and Struik, 1999 have been summarized that average yield is 2-5 minitubers per plant. Nevertheless the number of obtained tubers significantly depends on variety and crop husbandry techniques (Struik P.C., 2007).

The aim of this investigation was the comparison of minituber number and weight distribution depending on variety at uniform planting density.

MATERIALS AND METHODS

From 2009 to 2012 seven varieties were studied in respect of tuber number per plant and tuber weight classes. Investigation was carried out at State Priekuli Plant breeding institute's greenhouses with total area of 1000 m^{-2}.

Potato microplants obtained from *in vitro* culture were planted in fertilized (N, P, K, Ca, Mg, S) peat with pH adjusted to 5.3 in plastic beds and plastic boxes. Previous investigations have shown that minituber number per plant was not significantly different between two planting container types.

Potato microplants were planted in period from the first decade of april till the third decade of may. Planting density was 45 plants per m^{-2}. Applications of foliar fertilizer was provided 3 times per growing season. Destructive harvesting was performed on average 90 days after planting.

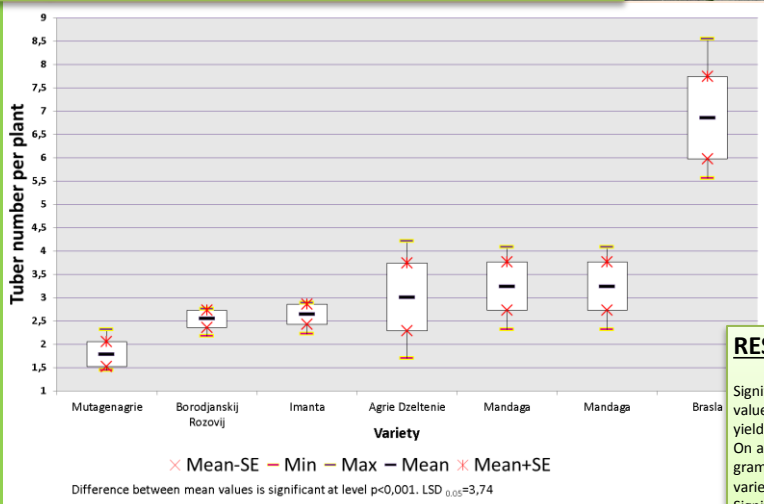

Figure 1. Minituber number per plant, 2009-2012

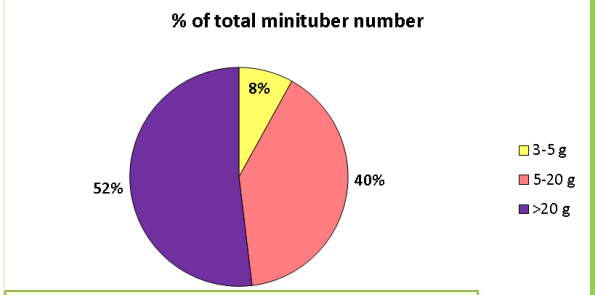

Figure 2. Minitubers weight distribution, mean 2009-2012, %

RESULTS AND DISCUSSION

Significant influence of genotype on tuber number per plant was observed ($p<0.001$). Mean values of investigated varieties ranged from 1.79-6.85 tubers per plant leading to the average yield of 3.33 minitubers per planted plant (Figure 1).

On average 52 % of harvested tubers outweighed 20 grams, 40 % were in range between 5-20 grams and 8 % were under weight of 5 grams (Figure 2). Statistically significant influence of variety on tuber number 3-5 grams and >20 grams was observed ($p<0.05$) (Figure 3).

Significant relationships between tuber number and tuber weight distribution were found ($p<0.05$). Data obtained by Spearman's rank correlation indicated positive correlation between average tuber number per plant and tuber % in weight class 3-5 grams ($r = 0,522$). Negative correlation was observed between average tuber number per plant and tuber % in weight class >20 grams ($r = -0.434$).

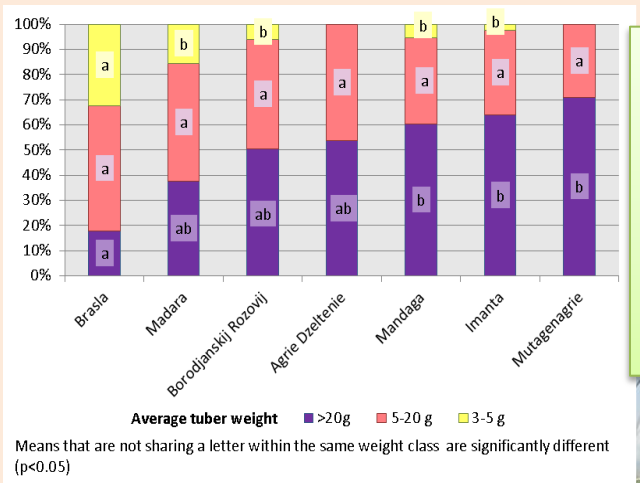

Figure 3. Minitubers weight distrubution depending on variety, mean 2009-2012, %

Obtained results indicated possibilities for optimization and increasing of effectiveness of minituber production. At the specific planting density most of investigated varieties produced more than 50% of tubers heavier than 20 grams. This finding lets us to assume that increasing of planting density would be the first activity towards increasing of production effectiveness. As well we can assume, that increasing of planting density will lead to decreasing of average minitubers weight, therefore it is relevant to be aware about field performance of various minitubers weight classes at the specific location in Northeastern Europe.

In order to receive these goals, investigation was started in 2013.

Minitubers of three potato varieties 'Monta' (early), 'Prelma' (medium early), 'Mandaga' (medium late) were grown in greenhouse in 2013. Tubers were graded in 4 classes by weight (3-5 g, 5-10 g, 10-20 g, >20 g) and in the spring of 2014 these tubers were planted in field with aim to compare their performance depending on the weight class. At the same time greenhouse trial with various planting densities (63 plants m^{-2}, 95 plants m^{-2}, 142 plants m^{-2} and 184 plants m^{-2}) for the same varieties has been be conducted. The aim of the study is to find the most efficient planting density for obtaining largest number of acceptable size minitubers with perfect field performance (high seed tubers yield). This approach will increase the efficiency of minituber (potato initial seed material) production and will improve the effectiveness of potato seed production system.

Literature

Gaujers V.(1962) Kartupeļu šķirnes. R:Latvijas Valsts izdevniecība,102 lpp

Wiersema S.G. and Struik P.C. (1999) Seed potato technology. Wageningen pers., 383 p

Struik P.C. (2007) The Canon of Potato Science: 25.Minituber. Potato research, Vol. 50:305-308