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COMPARATIVE ASSESSMENT OF TRUE POTATO SEED-DERIVED GENOTYPES UNDER CONTROLLED CONDITIONS

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ABSTRACT. Potato is the subject of extensive and diversified scientific studies related to human nutrition, seed production, and feed and raw material for industry. Given the current climatic context and the need to ensure food security for a continuously growing population, the possibility of using the generative method for potato multiplication was tested with the aim of producing an alternative material that would complete the potato requirement. The biological material used in this study was represented by six potato genotypes derived from true seed and the Brașovia potato variety (control). This study was carried out through the following stages: germination under ”in vitro” conditions for potato seeds, micropropagation of the obtained microplants, planting in an ”insect-proof” protected space for potato microplants obtained ”in vitro”, and minituber production. The genotypes grown in a protected space were analysed in terms of the number of minitubers/plant, the weight of minitubers/plant and the calibration by size fractions of the minitubers. Among the genotypes studied, genotype 101/3 stood out in terms of the number of minitubers (13.92) and minituber weight (154.38 g) compared to the control variety. The best results in terms of the percentage of minitubers in the size class larger than 28 mm were obtained for genotype 102/3 (67.92%).

Keywords: micropropagation; minitubers; NDVI; SPAD; true potato seed.

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INTRODUCTION

Potato (*Solanum tuberosum* L.) is one of the most important food crops worldwide, but traditional tuber-based seed production systems are limited by disease transmission, high storage and transport costs, and the progressive phytosanitary degradation of planting material. Thus, research has focused on identifying alternative, sustainable and efficient solutions for producing high-quality seed potatoes.

True potato seed (TPS) obtained by the generative method is considered a promising alternative to seed tubers due to its logistical and phytosanitary advantages. TPS is free from most tuber-transmissible pathogens, has low production and transport costs, and enables easier genetic material conservation. Recent studies have highlighted that the use of TPS contributes to the modernisation of seed potato production systems, especially in the context of climate change and the need to reduce agricultural inputs (van Dijk *et al.*, 2025).

However, the high genetic variability of plants obtained from TPS requires its integration with modern biotechnological techniques. ”In vitro” culture plays an essential role in this regard, enabling the selection, multiplication and maintenance of healthy and uniform plant material. Research in recent years has demonstrated that plantlets obtained from TPS can be successfully used as starting material for in vitro micropropagation and microtuberisation, generating pathogen-free starting material (microplants and microtubers) suitable for subsequent multiplication stages (Cioloca *et al.*, 2023; Jácome Sarchi *et al.*, 2025).

The transfer of plant material resulting from the “in vitro” culture to protected spaces (greenhouses or tunnels) represents a critical stage in the seed potato production chain. Controlled temperature, light and phytosanitary protection conditions favour the production of uniform minitubers with a superior biological status. Recent studies have shown that minitubers produced in protected spaces from material derived from TPS have a high potential for multiplication and can be effectively integrated into pre-basic and basic seed production systems (Boubaker *et al.*, 2023; Cioloca *et al.*, 2024).

Thus, combining the use of TPS with “in vitro” technologies and cultivation in protected spaces represents a current and relevant research direction with a major impact on the efficiency, sustainability and phytosanitary security of potato seed production. Recent research at the international level confirms the potential of this integrated approach, emphasising the need to adapt technological protocols to local conditions and the genotypes used.

In the last decade, the development of TPS technology (botanical seed-propagated potato) has been considered a promising direction for modernising the potato production system due to its logistical and phytosanitary advantages compared to tuber propagation. The later maturation and reduced genetic uniformity of the crop can be balanced by the lower cost of TPS planting material, flexibility in planting time, and the lack of tuber-transmitted diseases (Bradshaw, 2022). Kiran *et al.* (2024) evaluated the growth performance of true seed potato plants under the agroclimatic conditions of south-central India and found that large tubers derived from TPS improved growth traits in potato cultivation in the region. One of the biggest challenges for potato growers is procuring planting material. Transporting tubers involves high costs and facilitates disease transmission through the mother tubers, which has a significant impact on production. TPS technology can be attractive for low-income farmers. The following advantages favour support for TPS-based production systems: transport and storage are more cost-effective; seeds represent a natural barrier against the transmission of diseases and pests; the amount needed to sow 1 ha is only 200 g compared to 2.5 tons of tubers, preserving valuable food resources that would otherwise be used as planting material (Kiran *et al.*, 2024). As botanical potato seed is disease-free, it is an excellent seed material for potato growers around the world (Buckseth *et al.*, 2022). van Dijk *et al.* (2025) proposed another approach to the use of TPS hybrids – direct sowing in the field – which could be more cost-effective because the production of seedlings in a protected space is no longer necessary. Using this method, there are three essential phases that must be successfully overcome before the yield formation stage of seed or tubers: seed germination, seedling emergence and plantlet establishment. The results of studies conducted over several years support the feasibility of direct sowing of TPS hybrids in the field under Dutch conditions. Competitive yields of 40.6 Mg/ha have been achieved for the seed tuber size classes, which may transform direct sowing of TPS hybrids from a feasible strategy to a practical alternative for future potato production (van Dijk *et al.*, 2025).

Recently published international studies have shown TPS technology to be a promising alternative to clonal propagation due to its logistical and phytosanitary advantages. Water stress is one of the main limiting factors in potato production. Obtaining varieties with drought tolerance and water use efficiency is a major direction in potato breeding programs.

The aim of this study was to evaluate the production capacity of potato genotypes originating from botanical seed in a protected space. Encouraging results were obtained under conditions of water stress induced "in vitro". This research aims to identify new potato genotypes capable of generating high, superior quality production, even in climatic conditions less favourable for potato cultivation.

MATERIALS AND METHODS

The first stage of the experiment was carried out in the Research Laboratory for Plant Tissue Cultures. The botanical seeds of the six potato genotypes (101/3, 101/6, 101/7, 102/2, 102/3, and 102/4) were used to inoculate Murashige–Skoog (MS) nutrient medium (Murashige and Skoog, 1962). The culture vessels were incubated in the growth chamber ensuring a temperature of 19–21°C with a photoperiod of 16-/8-h light/dark. Under these conditions, some seeds germinated, and after 45 days, the first potato plantlets were obtained. When they reached a height of approximately 10–12 cm, they were multiplied using uninodal stem fragments (*Figure 1*).

The microcuttings were used to inoculate MS medium with sucrose (30 g/L) and agar (9 g/L) and incubated in the growth chamber. The resulting microplants were micropropagated until the desired number of plantlets was obtained. The plantlets obtained from TPS were tested using the double antibody sandwich–enzyme-linked immunosorbent assay (DAS-ELISA) to identify possible viral infections. Based on the results, all of the tested material was healthy.

Microplants regenerated following "in vitro" germination of potato seeds were used for the micropropagation process. One-centimetre-long stem explants with an axillary bud and the related leaf and half of the neighbouring internodes was used. To test the water stress tolerance induced "in vitro", explants were used to inoculate MS culture medium supplemented with different concentrations of polyethylene glycol (PEG) (40, 48 and 0 g/L - control). The culture medium was sterilised in an autoclave at 121°C for 20 min. In test tubes with a 2 cm diameter and 15 cm height, 5 ml of culture medium was distributed, and the tubes were covered with aluminium foil caps. The cultures were incubated in a growth room (16-/8-h photoperiod and temperature of 20 ± 2°C. Observations and notations on growth parameters were made after 2, 4 and 6 weeks of "in vitro" cultivation.

The second stage took place in an "insect-proof" tunnel by planting potato microplants obtained from true seed in pots. The planting substrate consisted of a mixture of peat and perlite in a 5:1 ratio (*Figure 2*).

Figure 1 – "In vitro" micropropagation of potato plantlets starting from true seed

Figure 2 – Potting and development of potato plants in an "insect-proof" protected space

The microplants obtained "in vitro" are more fragile than potato plants obtained from tubers, given the limited nutritional resources. The "insect-proof" tunnel provides a favourable microclimate for the acclimatisation of plantlets from "in vitro" cultures and their development and protects them against viral infections transmitted by aphids. During the growing season, appropriate light and water supply conditions were ensured. Before planting, complex nitrogen, phosphorus, potassium (NPK) fertiliser (15:15:15) was administered, and foliar fertilisation was carried out during vegetation (Cropmax 25 mL/10 L water; Agroleaf Power 20 mL/10 L water; and Razormin 20 mL/10 L water). During the growing season, plants were monitored for health and foliage integrity using a non-invasive method (*Figure 3*). Measurements were taken at different plant development stages: before flowering, during flowering and before harvest.

A powerful indicator of plant stress is the phenomenon of light absorption and reflectance. Since chlorophyll absorbs red light, low reflectance in this band indicates that the plant under analysis is healthy. The cellular structures of healthy plants reflect light in the near-infrared band. When plants are stressed, reflectance in the red band increases, and that in the near-infrared band decreases. The Normalised Difference Vegetation Index (NDVI) estimates the health of vegetation and is a means of monitoring changes over time that occur in vegetation using multispectral remote sensing data. NDVI measurements range between −1 and 1 with higher values being an indicator of plant health.

A CROPSCAN (Multispectral Radiometer) device, a portable instrument that measures the incidence index and the radiation reflected by the leaf, was used to monitor potato plants at 8 wavelengths ranging from 460 to 810 nm (*Figure 3a*).

It is a modern device used to evaluate plant growth, estimate crop biomass, biochemical content, yield and crop quality. This method improves real-time monitoring and correction management of the crop's vegetation status.

The SPAD-502 device (KONICA MINOLTA) is a portable device widely used for rapid, accurate and non-invasive measurement of the chlorophyll concentration in leaves (*Figure 3b*). This equipment is widely used in research and agriculture and in various plant species to measure the intensity of the green colour based on the responses of a leaf exposed to light. The chlorophyll content can be estimated using these measurements. The device performs instant and non-destructive readings on the plant based on the quantification of light intensity.

Control variety Brașovia and genotypes 101/3, 101/6 and 101/7 belong to the semi-early precocity group, and genotypes 102/2, 102/3 and 102/4 belong to the semi-late maturity group. Approximately 140 days after planting, the minitubers obtained were calibrated, and the number of minitubers/plant and their weight were determined (*Figure 4*). To reduce losses during the storage period, the shoots were removed manually two weeks before harvest, and the plants were no longer watered. The minitubers obtained in the "insect-proof" protected space were used the following year as planting material to establish the clonal field.

After harvest, the minitubers of each plant were counted, weighed and calibrated. The objective of this phase was to obtain as many larger minitubers/plant as possible.

The experiment was conducted in a randomised design, with three repetitions, and all pots were arranged randomly in the tunnel, ensuring uniform growing conditions. At 140 days after planting, the minitubers obtained were calibrated, and the number of minitubers/plant and their weights were determined. Minitubers were divided into two calibration classes: smaller than 28 mm and larger than 28 mm. Data were analysed using analysis of variance, and differences between means were established at a 5% probability level according to Duncan's multiple range test (SPSS, 2017 program). Correlation of the measured parameters was performed using Pearson correlation.

Figure 3 – Non-invasive monitoring of vegetation health using multispectral data

Figure 4 – Harvesting, weighing and calibrating potato minitubers by size fraction

RESULTS

The main objective of this study was to determine the possibility of using the generative method of potato multiplication to produce an alternative material to supplement the potato requirement. The genotypes grown in protected space were analysed in terms of the number of minitubers/plant, the weight of minitubers/plant and the calibration of minituber size fractions.

The number of minitubers/plant, their weights and their distribution by size fractions varied depending on the genotype. The highest number of minitubers/plant was obtained in genotype 101/3 (13.92 minitubers/plant), followed by genotypes 101/7 (11.17 minitubers/plant) and 101/6 (10.92 minitubers/plant) (*Figure 5*). Compared to control variety Brașovia (5.5 minitubers), these genotypes presented very significant positive (+8.42 minitubers) and distinct significant differences (+5.67 and +5.42 minitubers, respectively). Genotypes 102/2, 102/3 and 102/4 presented insignificant differences from the control variety. Using the Duncan test, the seven genotypes were grouped into 2 homogeneous subsets (*Table 1*).

The Pearson correlation showed a significant correlation between genotype and the number of minitubers/plant (*Table 2*).

Genotype 101/3 (154.38 g) had the highest total wight of minitubers/ plant, showing a significant difference (+68.79 g) from the control variety, followed by genotypes 101/6 (129.83 g) and 102/4 (107.50 g). In the other genotypes, the differences were insignificant from the control variety (*Table 3*).

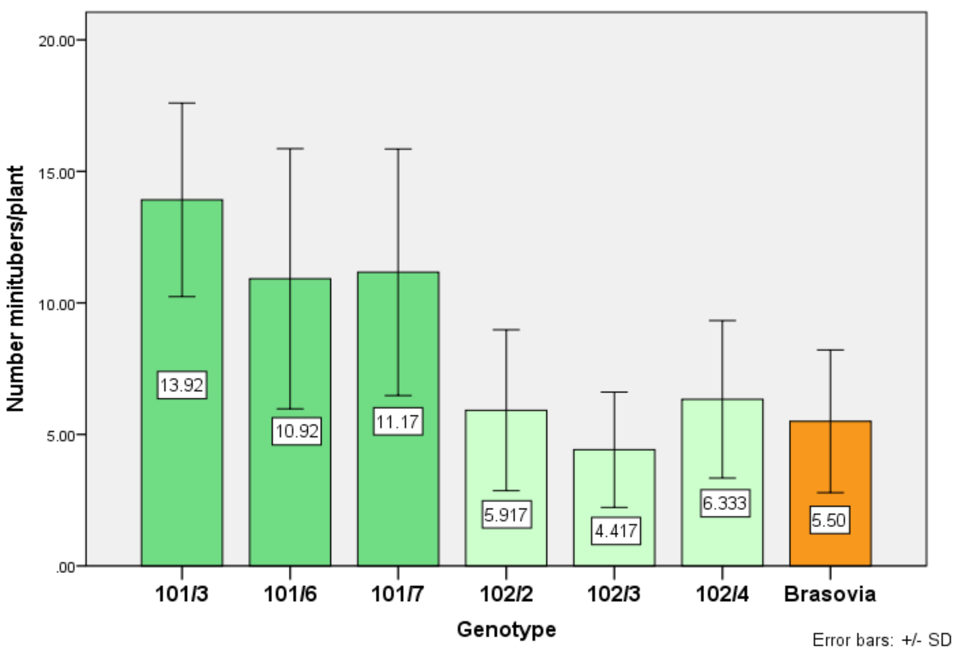


Figure 5 – Distribution of genotypes based on the average number of minitubers/plant

Table 1 – Influence of genotype on the number of minitubers

Genotype	Average number of minitubers/plant	Standard deviation	Diff.	Signif.
Brașovia (Ct)	5.50^{b}	±2.714	-	-
101/3	13.92^{a}	±3.679	8.42	***
101/6	10.92^{a}	±4.944	5.42	**
101/7	11.17^{a}	±4.687	5.67	**
102/2	5.92^{b}	±3.059	0.42	ns
102/3	4.42^{b}	±2.193	-1.08	ns
102/4	6.33^{b}	±2.995	0.83	ns

LSD 5% = 3.36 minitubers; LSD 1% = 4.72 minitubers; LSD 0.1% = 6.67 minitubers; Ct: control; LSD: least significant difference; *** - very significant positive differences; ** - distinctly significant positive differences; ns - non-significant differences. Means with the same letter are not significantly different

Table 2 – Pearson correlation

Genotype	Number of minitubers/plant
Pearson Correlation	0.232*
Sig. (2-tailed)	0.034

Table 3 – Influence of genotype on the total weight of minitubers

Genotype	Total weight minitubers/plant (g)	Standard deviation	Diff. (g)	Signif.
Brașovia (Ct)	85.58^{b}	±58.337	-	-
101/3	154.38^{a}	±100.581	68.79	*
101/6	129.83^{ab}	±90.057	44.25	ns
101/7	93.67^{b}	±30.743	8.08	ns
102/2	87.33^{b}	±50.791	1.75	ns
102/3	72.33^{b}	±42.654	-13.25	ns
102/4	107.50^{ab}	±48.069	21.92	ns

LSD 5% = 61.91 g; LSD 1% = 86.90 g; LSD 0.1% = 122.69 g; Ct: control; LSD: least significant difference
* - significant positive differences; ns - non-significant difference.
Means with the same letter are not significantly different

Genotype 101/3 produced a high number of minitubers/plant (13.92) and had the highest weight values, surpassing the other genotypes in terms of two particularly important aspects in establishing the productivity of a variety (*Figure 6*).

Genotype 102/3 obtained the lowest values in terms of the number of minitubers/plant (4.42) and their weight (72.33 g). Genotype 102/4 obtained the highest average tuber weight (20.37 g), followed by genotype 102/3 (17.29 g) (*Figure 7*).

Using Duncan's test, the seven potato genotypes were grouped into three homogeneous subsets (*Table 4*).

Thus, the lowest value was recorded for genotype 101/7, and in an intermediate position were genotypes 101/6, 102/2 and Brașovia, between which there were no significant differences. Genotype 102/4 differed significantly from the genotype 101/7.

For the seed fraction, we were interested in the minitubers within the minimum calibre of 28 mm or larger.

The best results in terms of the percentage of minitubers in the size class larger than 28 mm were obtained in genotypes 102/3 (67.92%), 102/4 (55.26%), 102/2 (54.93%) and Brașovia (54.55%) (*Figure 8*).

Three non-invasive measurements (NDVI and SPAD) were performed during the growing season (before flowering, during flowering and before harvest) to monitor potato growth and development. NDVI readings were taken in the morning between 10:00 and 11:00.

Vegetation indices, such as NDVI, provide information on leaf function, which is essential in capturing the light and CO_2 needed for the growth of underground organs and determines crop yield (Hermeziu *et al.*, 2025).

Table 4 – Influence of genotype on the average weight of minitubers

Genotype	Average weight (g)	Standard deviation	Diff. (g)	Signif.
Brașovia (Ct)	15.91^{abc}	±9.479	-	-
101/3	10.68^{bc}	±5.784	-5.23	ns
101/6	13.41 ^{abc}	±8.385	-2.50	ns
101/7	8.94^{c}	±3.728	-6.97	o
102/2	14.50 ^{abc}	±6.848	-1.41	ns
102/3	17.29^{ab}	±6.022	1.38	ns
102/4	20.37^{a}	±13.650	4.46	ns

LSD 5% = 6.61 g; LSD 1% = 9.28 g; LSD 0.1% = 13.09 g; Ct: control; LSD: least significant difference
o - significant negative differences; ns - non-significant differences.
Means with the same letter are not significantly different

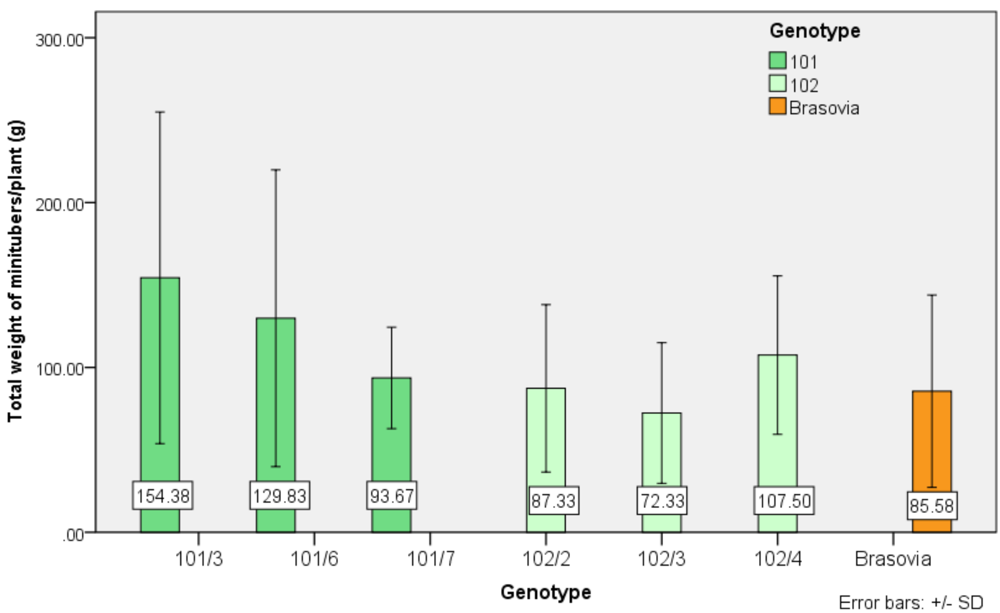


Figure 6 – Distribution of genotypes based on the total weight of minitubers/plant

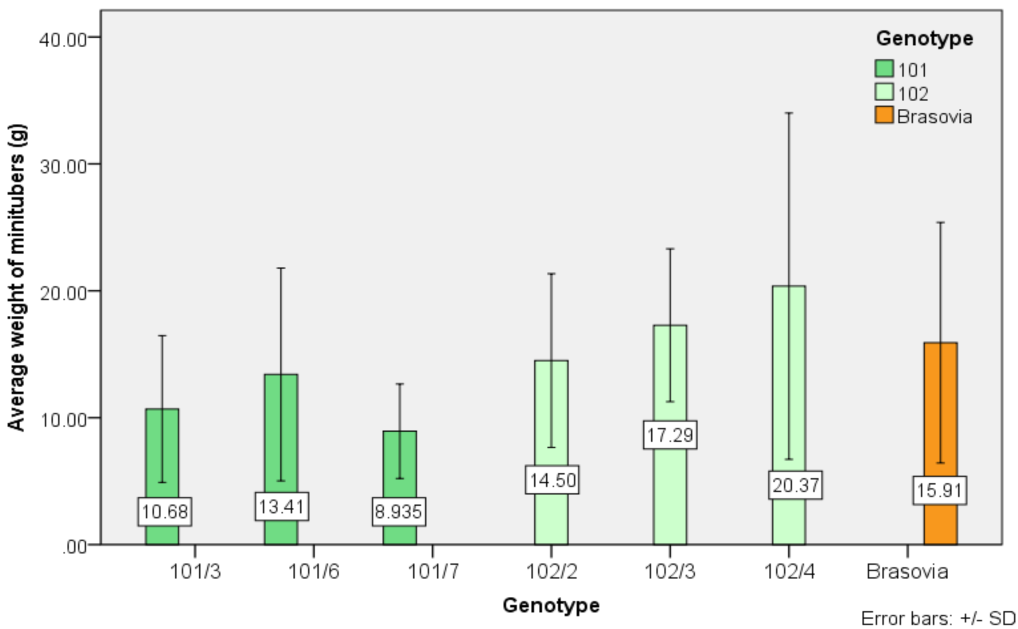


Figure 7 – Distribution of genotypes based on the average weight of minitubers

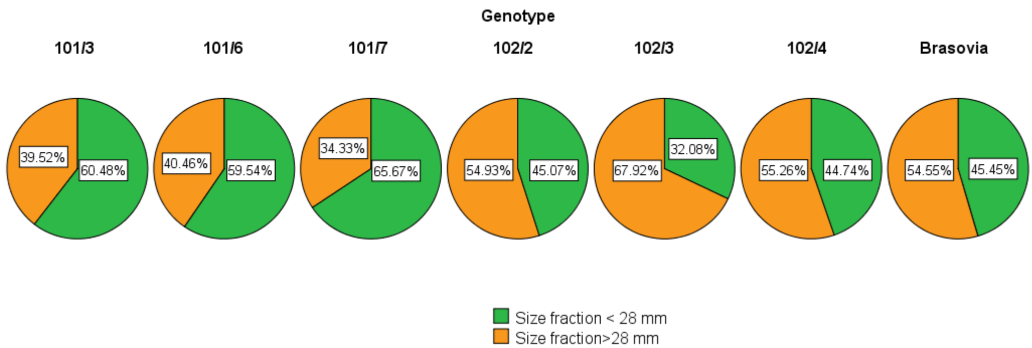


Figure 8 – Distribution of minitubers into size fractions
(diameter less than 28 mm and diameter greater than 28 mm)

NDVI, derived from the spectral reflectance of plant canopies, has been extensively used to assess biomass accumulation, chlorophyll content and nitrogen status in crops (Hermeziu *et al.*, 2025).

Higher NDVI values reflect better canopy health, photosynthetic activity and carbon assimilation, increasing biomass and tuber production. The reflectance indices showed the same tendency during the growth period, with the highest values obtained during the flowering stage and decreases at the maturity stage (Hermeziu *et al.*, 2025).

The recorded NDVI values were 0.883 for genotype 102/3, 0.882 for 101/3, 0.737 for genotype 101/7, and 0.785 for Brașovia (*Table 5*). The NDVI during the three periods of the growing season did not show significant differences between potato genotypes (*Figure 9*).

The recorded SPAD values ranged from 20.467 for genotype 101/7 to 43.367 for genotype 102/4 (*Table 6*). The values recorded for SPAD during the three periods of the growing season revealed significant differences between potato genotypes (*Figure 10*).

Pearson correlation highlighted a significant correlation between SPAD values recorded before harvest and minituber size fraction and between SPAD values and the total weight of minitubers/plant (*Table 7*).

Advances in precision farming tools, including NDVI and SPAD measurements, have enhanced our capacity to optimise essential agricultural resources.

These elements play a crucial role in improving crop productivity, plant vitality and nutritional value, significantly influencing the efficiency and environmental sustainability of agricultural practices (Hnizil *et al.*, 2024; Kizilgeci *et al.*, 2021; Yin *et al.*, 2023).

Table 5 – Normalised difference vegetation index (NDVI) measurements in potato at three key growth stages

Genotype	NDVI 7 Aug. mean	Standard deviation	NDVI 14 Aug. mean	Standard deviation	NDVI 2 Sept. mean	Standard deviation
101/3	0.841	0.075	0.882	0.074	0.847	0.046
101/6	0.822	0.045	0.858	0.097	0.862	0.065
101/7	0.814	0.065	0.844	0.063	0.737	0.086
102/2	0.829	0.070	0.870	0.057	0.849	0.058
102/3	0.812	0.077	0.883	0.033	0.880	0.037
102/4	0.828	0.091	0.878	0.055	0.856	0.055
Brașovia	0.785	0.147	0.849	0.061	0.848	0.063
Total	0.819	0.085	0.866	0.065	0.840	0.073

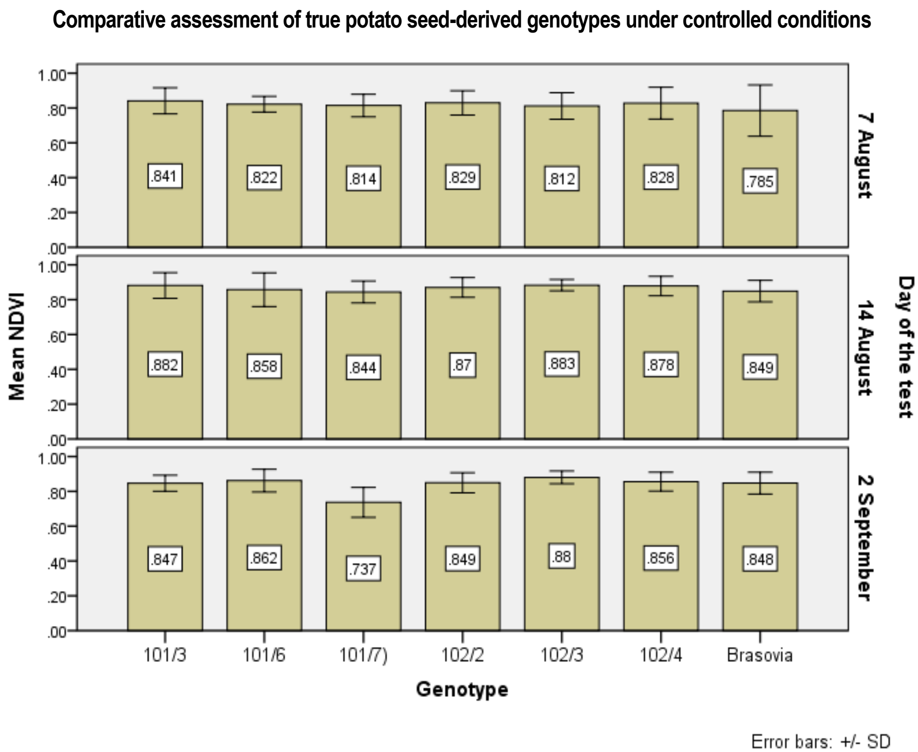
Table 6 – SPAD chlorophyll content in potato at three key growth stages

Genotype	SPAD 7 Aug. mean	Standard deviation	SPAD 14 Aug. mean	Standard deviation	SPAD 2 Sept. mean	Standard deviation
101/3	35.433^{ab}	8.779	40.233^{ab}	6.226	38.325^{ab}	6.690
101/6	30.633^{bc}	7.439	32.267^{c}	7.170	37.200^{b}	9.540
101/7	25.542^{c}	8.305	24.342^{d}	6.622	20.467^{c}	4.573
102/2	34.658^{ab}	11.455	39.733^{ab}	11.024	40.808^{ab}	7.774
102/3	35.558^{ab}	7.311	41.608^{a}	4.175	42.750^{ab}	7.970
102/4	40.658^{a}	6.746	42.958^{a}	3.844	43.367^{a}	3.485
Brașovia	29.183^{bc}	7.072	34.958^{bc}	7.663	40.550^{ab}	4.593
Total	33.095	9.244	36.586	9.140	37.638	9.774

Table 7 – Pearson correlation

		Number of minitubers/plant	Minituber weight	Total weight of minitubers/plant	Size fraction (%)
SPAD 2 Sept.	Pearson Correlation	−0.201	0.152	0.320**	0.246*
	Sig. (2-tailed)	0.067	0.169	0.003	0.024

** - Correlation is significant at the 0.01 level (2-tailed)
* - Correlation is significant at the 0.05 level (2-tailed)



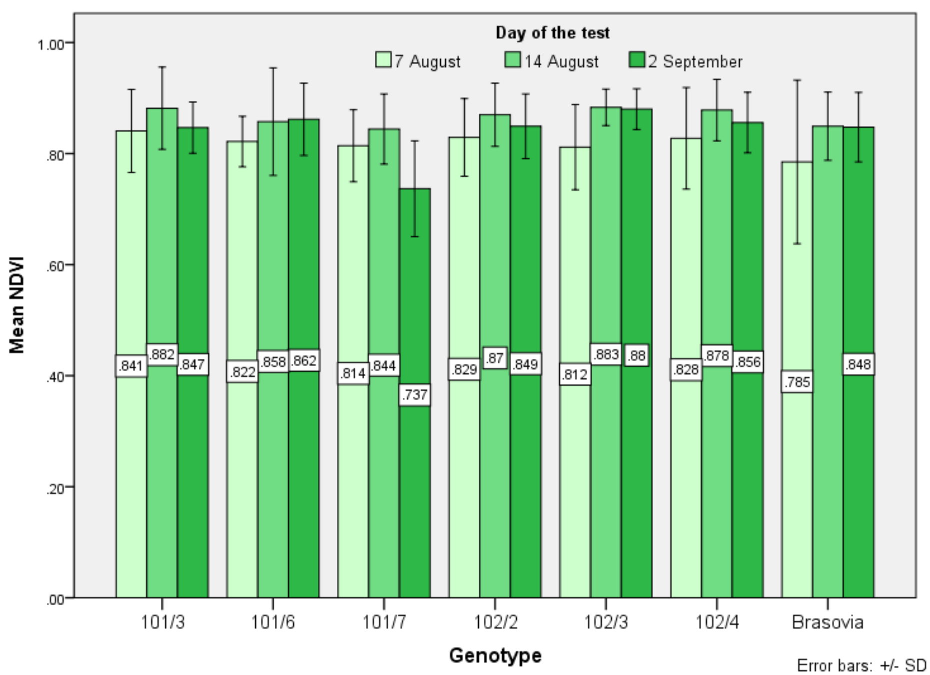
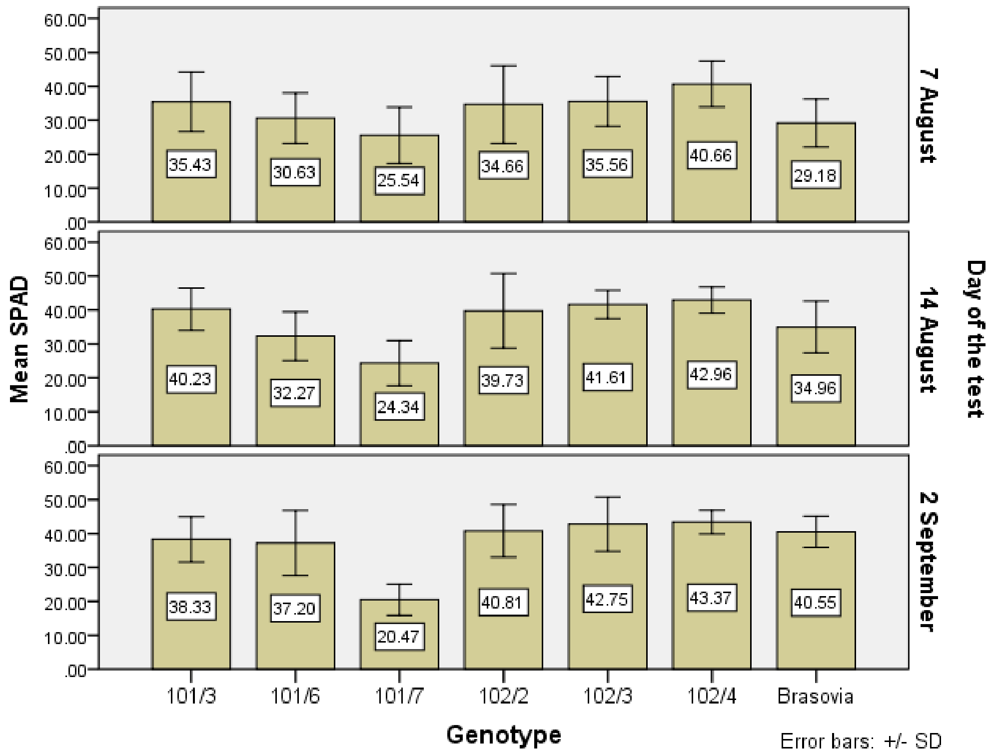


Figure 9 – Distribution of the normalised difference vegetation index (NDVI) values by genotype and growth stage: 7 Aug. (before flowering); 14 Aug. (during flowering); 2 Sept. (before harvest)



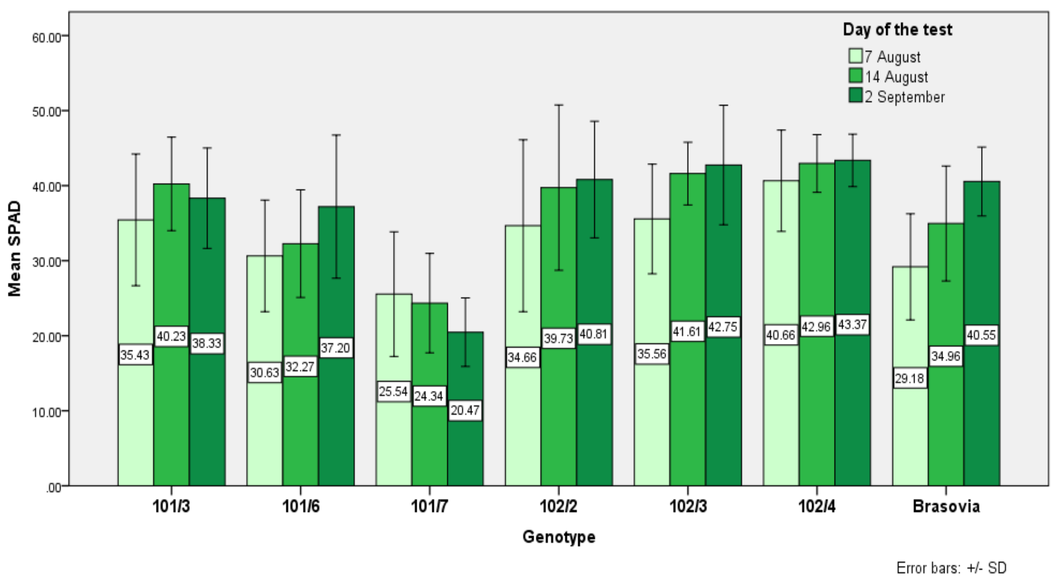


Figure 10 – Distribution of soil plant analysis development (SPAD) values by genotype and growth stage: 7 Aug. (before flowering); 14 Aug. (during flowering); 2 Sept. (before harvest)

DISCUSSION

The highest number of minitubers/plant was obtained by genotype 101/3, which was also distinguished by the highest total weight of minitubers/plant.

Genotype 101/3 outperformed the control variety in terms of the number of minitubers and their total weight, suggesting a possible better efficiency in biomass accumulation and different assimilate allocation to reserve organs.

This indicates superior tuberisation capacity and better adaptation to cultivation conditions in protected spaces. The results obtained in this study regarding the number of minitubers/m^2 (315 minitubers/m^2, with a range of 162–504/m^2) are similar to those reported in by Sikka *et al.* (1994) (367/m^2 with a range of 222–533/m^2).

Genotypes 102/4 and 102/3 had the best average weight of a minituber but did not stand out in terms of the number of minitubers/plant. In our study, TPS-derived genotypes obtained an average of 4 kg of minitubers/m^2, similar to the value reported by El-Amin *et al.* (1996) (3.1–5.1 kg/m^2). Genotype 102/3 had the highest percentage of minitubers in the size fraction larger than 28 mm. The distribution by size fractions highlights differences between genotypes. Genotypes that recorded a higher share in the size fraction >28 mm are considered more suitable for producing the planting material later used to obtain seed potatoes. The NDVIs recorded for genotypes 101/3 and 102/3 were higher than those of the other genotypes. The highest SPAD values were recorded in genotype 102/4, and a significant correlation was observed between SPAD and the total weight of minitubers.

The results of this study address an alternative method of seed potato production. The identification of genotypes with a high tuberisation capacity within lines derived from TPS is important in breeding programs. Genotypes that outperformed the control variety in both the number and weight of minitubers are considered promising candidates for integration into breeding programs and for use in commercial seed production systems.

After completing the acclimatisation stage, the in vitro-grown plantlets proceed to the minituber production phase (Sarchi *et al.*, 2025; Sidibe *et al.*, 2020). This is an essential component in seed potato production programs with the aim of obtaining healthy and high-quality starting material (Boubaker *et al.*, 2023; Sarchi *et al.*, 2025). Minituber production is influenced by several factors. In substrate transfer systems, production tends to reach an average of 2–5 tubers per microplant (Sarchi *et al.*, 2025; de Morais *et al.*, 2018). Regarding the size of the minitubers, the reported diameters ranged from 8 to 28 mm or from 4 to 12 mm (Sarchi *et al.*, 2025; Boubaker *et al.*, 2023).

From 2022 to 2024, Tokbergenova *et al.*, 2025 evaluated the capacity of potato minituber production of microplants obtained in vitro under greenhouse conditions and found that the maximum weight of minitubers/plant varied between 65.66 and 84.6 g/plant. The highest number of minitubers/plant was 6 in 2024, with an average over 3 years of 5.4 minitubers/plant. The highest minituber diameter (average of the 3 years of study) ranged between 39.2 and

45.8 mm. The application of bioorganic fertilisers had a stimulating effect on potato plants, and the number of minitubers/plant ranged between 3 and 8. The average weight of minitubers was between 15 and 26 g, and the total weight of minitubers/plant was 45–208 g.

Gul *et al.* (2020) determined the influence of row and plant/row spacing on the number and weight of potato minitubers obtained in a greenhouse and showed a positive effect of increasing inter and intra plant spacing on minituber production. A spacing of 30×15 cm was the most effective for transferring plantlets to the greenhouse to obtain maximum minituber production. Regardless of spacing, the number of larger minitubers was lower compared to the number of medium and small minitubers.

Regarding the calibration class, the maximum average value (28.33 and 27.04 mm) was obtained with a spacing of 30×15 and 20×10 cm, respectively. Additionally, the two spacings led to the best results in terms of the total weight of minitubers/plant (165 and 145.38 g, respectively).

Abdeen *et al.* (2025) followed the production of minitubers and the Super Elite seed category in five potato varieties, starting from microplants obtained in vitro. The five varieties behaved differently, and the number of minitubers/plant varied between 2.2 and 10.2, with a weight between 5.12 and 41.56 g.

Recent studies have indicated that factors such as genotype, cultivation technology, applied fertilisation and nutritional space influence the production of minitubers obtained from potato microplants transferred from *in vitro* conditions to the greenhouse.

CONCLUSIONS

This study aimed to evaluate genotypes derived from TPS, considering the possibility of using the generative method of potato multiplication to obtain an alternative material, which would complete the potato requirement. Six genotypes were monitored in a protected space (insect-proof tunnel) to determine their tuberisation capacity (number of minitubers/plant, average weight of minitubers and total weight of minitubers/plant) compared to the Brașovia variety.

These genotypes were also evaluated in terms of calibration class, as those genotypes that managed to produce a large number of large tubers (>28 mm) are important. The highest number of minitubers/plant was obtained by genotype 101/3 (13.92 minitubers/plant), followed by genotypes 101/7 (11.17 minitubers/plant) and 101/6 (10.92 minitubers/plant). Genotype 101/3 (154.38 g) had the highest total weight of minitubers/plant, showing a significant difference (+68.79 g) from the control variety, followed by 101/6 (129.83 g) and 102/4 (107.50 g). Genotype 101/3 produced a large number of minitubers/plant (13.92) and had the highest weight values, surpassing the other genotypes in two important aspects for establishing the productivity of a variety. Genotype 102/4 obtained the best tuber weight (20.37 g), followed by 102/3 (17.29 g).

The best percentage of minitubers in a size class larger than 28 mm was obtained in genotypes 102/3 (67.92%), 102/4 (55.26%) and 102/2 (54.93%), which outperformed the control variety, Brașovia. Developments in precision agriculture technologies, such as NDVI and SPAD measurements, improve production and promote sustainable agricultural practices, reducing the environmental impact.

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