

SUMMARY

The present habilitation thesis presents an overview of the main results of the professional background and outlines future directions for career development. It presents the outcomes of research activities centered primarily on four main areas. One area concerns the identification and quantification of 9 main components from essential oil (α -pinene, β -pinene, 1,8 cineole, cis- β -ocimene, trans- β -ocimene, linalool, camphor, borneol, linalyl acetate), obtained from *Lavandula angustifolia* L. cultivated in four different regions of the Transylvanian plane and to emphasize the influence environmental factors (temperature, wind speed, precipitation) and culture technology (organic versus conventional), on biomass production of *Mentha x piperita* L., leaf yield and oil production under conditions specific to Central Transylvania, Romania. Another area focuses on testing new herbicide formulas compared to classic sugar beet herbicide recipes, depending on the sugar beet variety, quantifying the production performance of the Gorilla, Vanghelis, Tesla and Penalty sugar beet hybrids in terms of dry matter, yield and sugar yield and to identify the interactions between the aforementioned traits with environmental temperature and precipitation, as well as to quantify the production performance of some sugar beet genotypes or productivity and sugar yield in relation to temperature and precipitation. The third area concerns the identification of the differences between the groups of consumers of organic food products in the Northwest Development Region of Romania regarding their perceptions and attitudes towards these food products. At the same time, manufacturers and sellers will have a profile of their consumers, which will help them adapt products to their needs, while the fourth, the identification of the action of an environmentally friendly fertilization solution, with the phytohormone GIBB A3, on several macroelements (K, P, Ca, Mg, S, Cl) and microelements (Fe, Mn, Zn) in two corn hybrids grown in conditions specific to Transylvania.

The evaluation of the composition of the essential oil extracted from two varieties of *Lavandula angustifolia*, Maillette and Vera, cultivated in four areas with pedo-climatic conditions specific to Transylvania, Romania, highlights the main compounds both qualitatively and quantitatively. Following the analysis, two chemotypes were identified: one corresponding to linalool in the case of the Maillette variety, and another to linalyl acetate for the Vera variety. The main compounds in lavender essential oil include linalyl acetate, linalool, α -pinene, β -pinene, 1,8 cineole, cis- β -ocimene, trans- β -ocimene, camphor and borneol. However, the proportions of these compounds vary according to the cultivation area. For example, in the case of the Vera variety cultivated in Sânpaul, Cămărașu (Cluj County) and Fetindia (Sălaj County), significant differences were identified in the proportion of α -pinene, β -pinene, 1,8-cineole and camphor in the essential oil. Cluster analysis reveals similarities in the main component profile - linalool and linalyl acetate - for both chemotypes, Maillette

and Vera, with variations in the amounts of essential oil components in the Vera cultivar depending on the cultivation location.

Our study showed that biomass and oil production of mint leaves are significantly influenced by cultivation technology and environmental factors. Mint biomass and leaf yields increased significantly in the second growing season compared to the first, with the highest yields obtained in the conventional crop and the lowest in the organic crop in both seasons. However, oil production decreased by 27% on average in the second season, regardless of cropping technology. Higher oil yields were obtained in the organic variant, while the lowest occurred in the conventional variant. Our results indicate that temperature and wind speed significantly influence oil production, and moderate temperatures but not higher than 30°C and low wind speed have a positive impact on peppermint oil production. At the same time, biomass and leaf yield are positively influenced by the increase in temperature and precipitation.

To determine the effect of temperature, rainfall and essential agricultural inputs such as irrigation and fertilization on the performance of the studied sugar beet hybrids, dry matter levels, yield and sugar production were analyzed and correlated with temperature and rainfall factors. The best results for the analyzed production characteristics were obtained for Vanghelis and Tesla hybrids, when the crops benefited from irrigation and NPK fertilization at a rate of 180-120-120 kg/ha. Root yield was significantly influenced by genotype, irrigation and the interaction between genotype and fertilization, while sugar yield was predominantly influenced by genotype. Correlations between environmental temperature, precipitation and production characteristics, given agricultural inputs (irrigation, fertilization), were moderate to strong and positive. Four main factors were identified, representing production, agricultural inputs and environmental factors, but the total variability is explained by two main components: genotype (42.24%) and production (25.08%).

The study demonstrated that the application of Conviso Smart technology in sugar beet production highlights the high performance of SMART sugar beet varieties. SMART Kipunji had the highest sugar beet yield and SMART Belamia had the highest sugar and beet yield. The yields and productions associated with the SMART weed control system exceeded the averages obtained under classical weed control conditions. Strong and very strong correlations were observed between beet yield and sugar yield, as well as between beet yield and relative sugar yield. According to the PCA analysis, beet yields, regardless of variety, influence sugar beet production, sugar and relative sugar yields. In addition, weed control treatments significantly influence sugar production, except for Hooper, where it affects sugar beet yield and the relative performance of Belamia and Kipunji.

The results of the study emphasize that the analysis of combined variance for yield, sugar content and production, together with the traits associated with sugar beet, provides a broad understanding of the factors influencing these parameters. The G x E interaction proved significant for all traits described in all sugar beet genotypes

in the four analyzed environments, suggesting the need to test genotypes in multiple environments before effective selection. From the AMMI ASV analysis, genotype G10 showed high performance in yield, sugar content and production, but with low ASV values, indicating excellent stability. According to AMMI 1 biplot, 2 biplot and "who won where" analysis, the highest sugar beet yield was recorded by genotype G11 in Environment 2 compared to the other genotypes. The use of the AMMI model allows the description of the G x E interaction, and the AMMI ASV and biplot approaches facilitate the identification of genotypes with stable production traits and adaptability to specific environments, and the "who won where" model allows the grouping of genotypes based on their similar performance in various environments.

In order to understand consumers' perception of organic agriculture in the Northwest Development Region of Romania, a survey was conducted on a sample of 420 respondents, of whom 386 completed the questionnaires validly. In the demographic profile of the participants, the majority were men (66.4%), and the 30-59 age groups were relatively equally represented, with only 9.3% of respondents being over 60 years old. Regarding education, most of them graduated from high school, and only 1% had no education. Most of the respondents considered that organic farming cannot cover the needs of agricultural products at the national level, due to the lower yield. Also, more than 65% agreed that this type of agriculture lends itself to small and subsistence farms rather than large ones. About 40% of respondents did not agree that organic products are exclusively those officially certified with specific labels, and the majority believed that an organic product must be free of additives and preservatives, suggesting insufficient information about organic product standards and principles of organic farming. The study points out that socio-demographic profile influences perceptions of organic farming. Male respondents more often agreed that organic farming protects the environment and rejected the use of chemical fertilizers and pesticides in this type of farming. Respondents with a higher level of education also rejected the idea that organic farming could cover the need for agricultural products at the national level and were reluctant to use chemicals in this system.

It is concluded that the production and marketing of organic food represents an important opportunity for Romania to enter the European market, as rural development policies are needed to promote organic agriculture, to support farmers in the restructuring of farms and product diversification, and to facilitate access to food markets. ecological products.

Organic farming practices are increasingly popular among producers and offer a suitable alternative for small farms. Consumers are aware of the impact that organic products have on the sustainable development of agriculture. The study showed that those consumers interested in organic products are educated people, aged over 35, concerned about the effects of food on health. The growing interest in non-GMO, pesticide-free food products with high mineral and vitamin content reflects consumers' orientation towards a healthy and sustainable diet, suggesting the

potential for market strategies to encourage the consumption of organic products. Although the factors that motivate the consumption of organic products are similar among various consumer groups, their importance differs significantly between clusters. Also, the results indicate that respondents perceive organic food as being obtained through traditional agricultural and processing methods, rather than through modern technologies, which suggests an inclination towards the concept of slow food. These conclusions provide valuable information for development strategies and the support of small farms and local products in the Northwest Development Region of Romania. For manufacturers and retailers, knowing the profile of consumers and their preferences is essential for adapting products to market requirements. Offering the right products at competitive prices and qualities can improve consumer satisfaction and increase the economic efficiency of producers.

The results of our study suggest some important conclusions: in both corn hybrids examined, Turda Star and Turda 200, the macroelements with the highest concentration are potassium (K) and phosphorus (P), in both treatment options (with and without biostimulation). The concentrations are lower in the variants treated with the GIBB A3 biostimulator, compared to the control samples, which were not exposed to this gibberellin-type phytohormone. The differences between the concentrations of macro and micro elements in Turda Star and Turda 200 hybrids are statistically significant at various thresholds for most of the elements analyzed in this study.

Simple correlations of varying intensities, from very weak to very strong, were observed in both hybrids studied. For K concentrations in biostimulated and non-biostimulated variants, moderate negative correlations were reported in both Turda Star ($R = -0.463$) and Turda 200 ($R = -0.534$). Regarding P concentrations, negative but weaker correlations were also evident for Turda Star ($R = -0.297$) and Turda 200 ($R = -0.279$). Principal component analysis (PCA) indicated the presence of the same two principal factors for both hybrids. The first factor, which explains most of the variation (53.28% in Turda Star and 51.12% in Turda 200), is represented by the culture technology and is closely correlated with the experimental variables (macroelements - K, P, S, Mg, Cl, Ca - and trace elements - Fe, Mn, Zn). The second factor, associated with the practice of biostimulation by GIBB A3, explains a smaller part of the variation (18.17% at Turda Star and 15.13% at Turda 200). Regardless of the hybrid, biostimulation has a more pronounced influence on plant K concentrations.

Our study indicates that GIBB A3 gibberellin biostimulation affects plant physiology, reflected by reducing K and P concentrations, elements that play a role in plant transpiration. Further research is needed to deepen the correlations and explain the interrelationships between the development of maize hybrids, their macro and micronutrient content and plant physiological traits.