ACTA MYCOLOGICA
Vol. 47 (2): 185–189
2012

Assessing genetic resources of summer truffle in Slovakia

JÁN GAŽO[1], MARIÁN MIKO[1], MARTIN MIKO[2] and JURAJ CHLPÍK[3]

[1]Department of Genetics and Plant Breeding, Slovak University of Agriculture in Nitra
Tr. A. Hlinku 2, SK-949 76 Nitra, Jan.Gazo@uniag.sk
[2]The First Slovak Truffle Association, Dlhá 1, SK-949 76 Nitra, marrtinmiko@gmail.com
[3]Department of Pedology and Geology, Slovak University of Agriculture in Nitra
Tr. A. Hlinku 2, SK-949 76 Nitra, Juraj.Chlpik@uniag.sk

Gažo J., Miko M., Miko M., Chlpìk J.: *Assessing genetic resources of summer truffle in Slovakia*. Acta Mycol. 47 (2): 185–189, 2012.

A study of summer truffle genetic resources, their description and evaluation of economically important traits in Slovak natural truffiéres started since 2005. Draft of national descriptor list has been developed to manage truffle genetic resources collected in the information system "Tuber Aestivum/ Uncinatum Phenotype Data" (TAUPD). Revision was performed in TAUPD to increase effectiveness of truffle breeding process.

Key words: descriptor list, *Tuber*, natural truffiéres

INTRODUCTION

Roughly 300 mushroom species are edible, but only 30 have been domesticated and 10 are grown commercially (Chang 2005). Truffles belong to economically important species of ectomycorrhizal fungi. Currently, the ecological requirements of these fungi are well known and cultivation practices have been developed. Yet it still remains difficult to predict their yields (Reyna-Domanech, Garcia-Barreda 2009). It is observed, that production of truffles is not increasing after the introduction of artificial inoculation of host plants in seventies of the last century (Hall et al. 2007). Are environmental or genetic factors the reason of this state?

MATERIAL AND METHODS

Truffle inventory research started in Slovak Republic in 2005. At present, in total 39 natural truffiéres of summer truffles (*Tuber aestivum* Vittad.) were identified by trained dogs. In each locality, slope inclination, topography and GPS position was recorded. Standard mycological description was applied for observed truffle carpophores. Productive traits (average weight of carpophores, seasonal period of fructification, regularity of fructification in years, prevalence of the forma *uncinatum* carpophores in the production, shape uniformity and share of nonstandard carpophores) were evaluated in natural truffiéres in selected genets. New draft of descriptor list for Genetic Resources *Tuber aestivum/uncinatum* created according Guidelines for descriptor lists (Bioversity International 2007) was applied for truffle samples. The draft of descriptor list is based on three groups of information: passport data with truffle habitat analysis, including host plants and herbarium

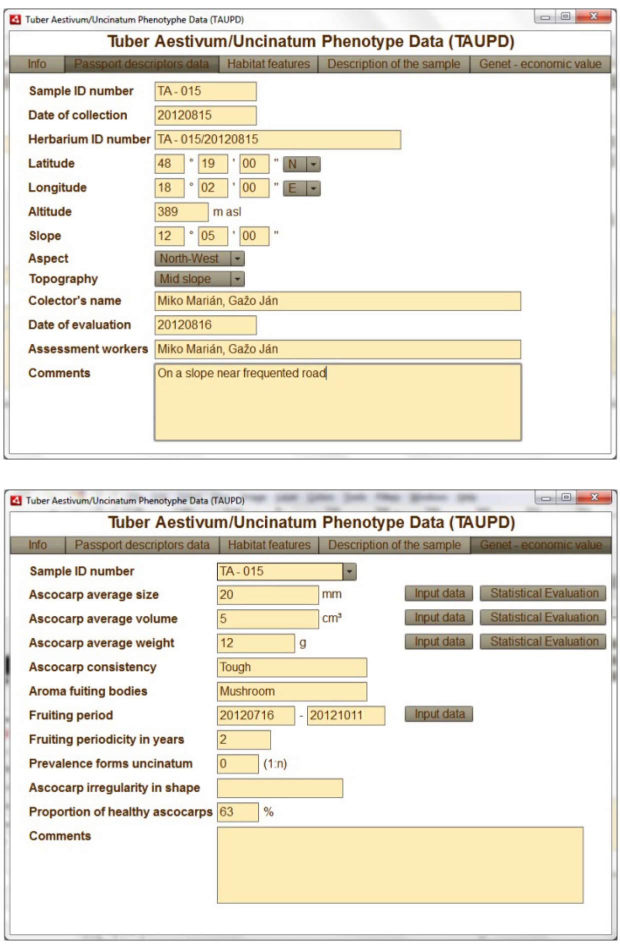


Fig. 1. Preview of the information system TAUPD.

identification numbers of entries in the Gene Bank (27 descriptors); description of carpophores (21 descriptors); and group of economically important production traits of studied genets (10 descriptors). Studied samples data were collected into the information system Tuber Aestivum/Uncinatum Phenotype Data (TAUPD) (Fig. 1).

RESULTS AND DISCUSION

Natural truffiéres in Slovakia are typically located on foothills and in valleys, with space isolation between localities as small patches of truffle habitats. Collected samples are therefore considered as the unique locally adapted genetic material with diversity suitable for improvement process of *Tuber aestivum*.

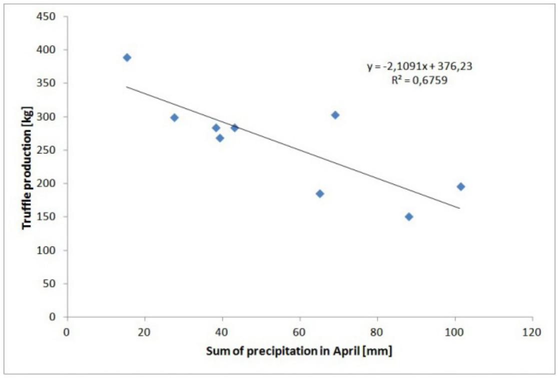
Usually fruit bodies collected from nature serve as a source of spores for production of inoculated host plants. To decrease costs, some producers of truffle inoculated plants purchase for inoculation procedures low quality truffles, especially in the sense of market quality. According to Hall et al. (2007) there is no information available on whether small truffles begat small truffles or inferior, precocious truffles fruiting early in the season are likely to produce similar truffles, but they recommend to inoculate plants only with the best truffles available.

In terms of the truffle grower it is essential to know the basic parameters of fruit bodies used for production of truffle inoculated plants: size of fruit bodies, intensity of truffle odour, period of fructification (*T. aestivum/uncinatum*), length of fructification period, regularity in fructification, provenance, host tree species, soil properties, etc.

The most of the above mentioned traits are determined by their genetic composition, the environment in which the organism is grown, and the interaction of genotype with the environment. Environmental conditions having a dynamic character like rainfall and its distribution over the year can be managed by growers. The breeder should identify optimal environment for the realization of productive genets (Fig. 2).

Besides environmental conditions, interaction of two biological systems (host tree and truffle) increases phenotypic variability of ectomycorrhizal mushrooms. The population of the host plants and population of ectomycorrhizal mushrooms may be in synergistic or inhibitory relationship. This relationship significantly affects heritability in generatively propagated progeny (Falconer, Mackay 1996).

Since the breeder is working with a material that in the phenotype combines genetic and environmental factors, his task is to identify the proportion of these factors and their interactions, basing on known information collected either from natural localities, or trials in the same environmental conditions. These conditions may be conservative, or variable with changing environment. Conservative environment as altitude, mother rock, composition of soil, aspect to the cardinal points and others can significantly influence the implementation of genotypic properties in the growing phenotype and can be fulfilled by careful selection of truffle plantation. The challenge for breeder is to identify and select those individuals that have genotypes



Correlation coefficient in month											
I.	II.	III.	IV.	V.	VI.	VII.	VIII.	IX.	X.	XI.	XII.
0,26	-0,14	0,09	-0,82	0,25	0,31	0,34	0,40	-0,52	-0,54	-0,71	-0,36
				0,561				-0,858			

Fig. 2. Analysis of dynamic environmental factors – regression analysis between precipitation and truffle yield in Slovakia according to historical records.

conferring desirable phenotypes, rather than individuals with favourable phenotypes due to environmental effects. These data can be obtained only after several years of study to determine heritability of major traits.

It needs to be emphasized that sexuality in truffle species has to be clearly understood in order to conduct rational genetic studies as well as improvement programs. In present we still do not know the level of heritability of important truffle traits. Our data in the information system TAUPD can help reveal traits with higher heritability. It is generally recognized that in order to maintain and breed high-yielding genets, the techniques employed in truffle improvement should be modified and improved in accordance with new findings and progress in the scientific world as a whole, and in microbiology and genetics in particular.

CONCLUSION

The aim of long term research of truffles in natural truffiéres with description of truffle genetic resources and evaluation of economically important traits will be a selection of suitable germplasm for further progress in effective truffle cultivation in Slovak Republic.

Acknowledgment. The paper was prepared within the research project MŠ SR – VEGA 1/1169/12.

REFERENCES

Bioversity International 2007. Guidelines for the development of crop descriptor lists. Bioversity Technical Bulletin Series. Bioversity International, Rome.

Chang S.T. 2005. Mushroom biology: the impact on mushroom production and mushroom products. In: Mushroom biology and Mushroom products. Chinese University Press, Hong Kong.

Falconer D.S., Mackay T. 1996. Introduction to Quantitative Genetics. Longman, Essex.

Hall I.R., Brown G.T., Zambonelli A. 2007. Taming the truffle. Timber press, Portland, London.

Hill J., Becker H. C., Tigerstedt P.M.A. 1998. Quantitative and ecological aspects of plant breeding. Chapman and Hall, London.

Reyna-Domanech S., Garcia-Barreda S. 2009. European Black truffle: Its potential role in agroforestry development in the marginal lands of mediterranean calcareous mountains. (In:) A. Rigueiro-Rodriguez, M.R. Mosquera-Losada, J. Mc Adam (eds). Agroforestry in Europe. Current status and future prospects, Springer Science.