

*D. Đukić, Zora Vučinić, L. Mandić, V. Spalević, Tatjana Papić,
Svetlana Nikčević¹*

**SPATIAL AND TIME VARIATIONS IN THE NUMBER OF FUNGI IN
THE AIR OF VINE ORCHARD
*PROSTORNO I DNEVNO VARIRANJE BROJNOSTI GLJIVA
U VAZDUHU ZASADA VINOVE LOZE***

Abstract

Spatial and daily dynamics of the number of fungi existing in the air of vine orchard was surveyed at the trial field of the Biotechnical Institute in Podgorica (locality - Ljesko field). Selective nutritional base for fungi (Capek's agar) was sown, employing sedimentation method in the morning, afternoon and evening hours under existing environmental conditions.

The number of fungi under consideration was estimated as the highest at higher temperature and wind speed, but at lower relative air humidity, i.e. in the afternoon, and as the lowest at lower temperature and wind speed, but at higher relative air humidity, i.e. in the morning. The highest number of fungi occurring in the morning and afternoon was registered on the southern, and that appearing in the evening, on the eastern side of the orchard. In terms of space, the number of fungi was the highest on the southern, and the lowest on the western side of the orchard. During the morning and afternoon periods, the number of fungi decreased from peripheral up to central orchard part, being a clear evidence of the plant phytocidal effect.

Key words: air, fungi, nutritional base, vine.

¹ Prof. dr Dragutin Đukić, Leka Mandić, Agronomski fakultet, Čačak
dr Zora Vučinić, mr Velibor Spalević, Tatjana Papić, dipl.inž., Biotehnički institut
Svetlana Nikčević, dipl. biolog, PMF, odsjek za biologiju, Podgorica.

Izvod

Praćena je prostorna i dnevna dinamika brojnosti gljiva u vazduhu zasada vinove loze na Oglednom imanju Biotehničkog instituta u Podgorici (lokalitet- Lješko polje). Selektivna hranljiva podloga za gljive (Čapekov agar) zasejavana je sedimentacionom metodom u jutarnjim, podnevnim i večernjim časovima u postojećim meteorološkim uslovima.

Konstatovano je da je brojnost gljiva u vazduhu najveća u uslovima povećane temperature i brzine vetra i snižene relativne vlažnosti vazduha, dakle u podnevnim satima, a najmanja u uslovima snižene temperature i brzine vetra i povećane relativne vlažnosti vazduha, t.j. u jutarnjim satima. Najveća brojnost gljiva u jutarnjim i podnevnim satima bila je na južnom a u večernjim satima na istočnom delu zasada. U sva tri doba dana brojnost gljiva je, uglavnom, bila najveća na južnoj, a najmanja na zapadnoj strani zasada. Tokom jutarnjih i podnevnih sati brojnost gljiva se smanjivala od periferije prema centru zasada, što ukazuje na fitoncicidno dejstvo biljaka.

Ključne riječi: vazduh, gljive, hranljiva podloga, loza.

INTRODUCTION

A fast increment in population's number all over the Earth has led to a more intensive agricultural production, implying the use of various chemical means and, thus, the possibility of greater environmental pollution. Thus, the state of biogeosphere as well as that of atmosphere are to be kept under the control of both global and microecological aspects (Đukic et al., 1999). Only after a good assessment of the biogeosphere condition or of its part (for example, atmosphere) can relevant economic and safety measures be taken.

Practical use of aeromicrobiological achievements is most likely to prevent plant diseases transfer through the air or, at least, to bring about rarer cases of such diseases, which has an important economic effect (Nemiro, Vlodevec, 1979; Fipri et al., 1981; Dunskij, 1982).

Considering that transfer of many plant diseases causals (or of their vectors) through the air represents a vital chain in the possible spreading of phytopatogenous microorganisms (Lidemann et al., 1982), the present investigation of spatial and daily dynamics of the number of fungi in the air of vine orchard seemed to our mind fairly contributory in terms of taking

adequate measures for the orchard's protection within an array of other measures.

MATERIAL AND METHOD

The trial was conducted at the experimental field of the Biotechnical Institute in Podgorica (the locality of Ljeskopolje), in the orchard of vine 6 year-old, with inter-row space of 2.5 m and a distance of vines in the row of 1.2 m.

Open Petri-cups with adequate selective base for fungi - Capek (pH value 5,5; sterilized 25 min. at 1,2 atm. and 115°C) were put on 17 experimental points with 3 replications at a distance 0,30-0,50 m from the plant and, using sedimentation method (10 min. of exposure), sown in the morning (6.30), afternoon (12.30) and evening (18.30) hours. At the same time, some abiotic factors (temperature and relative air humidity, atmospheric pressure, direction and wind speed and cloudness, tab.1) were measured in order to estimate their impact on the presence of fungi in the air. The loci of Petri-cups and, the order of sedimentation method application to the sowing of the three nutritional bases, are determined in the scheme (Fig.1).

Petri-cups, designated with numbers 3 (I), 7(N), 11(S) and 16(W) - I were placed outside the vine orchard on to the ploughed soil, thereby gravitating towards corresponding world directions (E -East; N-North, S-South, W-West). The Petri-cups, designated with 1 and 14 (N), 4 and 17 (S), 2(I) and 15(W) made up sector (II), whereas those designated with 5 and 6(E), 8(N), 10(S), 12 and 13 (W) belong ing to the inside (III) sector, were placed nearer the center of the orchard and, finally, those designated with 9 in the very center of the orchard (IV).

Incubation of the bases sown had been carried out in the thermostat (7 days at 28-30°C), after which the dynamics of a daily number of the fungi inside single sectors (I, II, III, IV) and world directions (N, E, S and W) were determined and appropriate statistical analysis made.

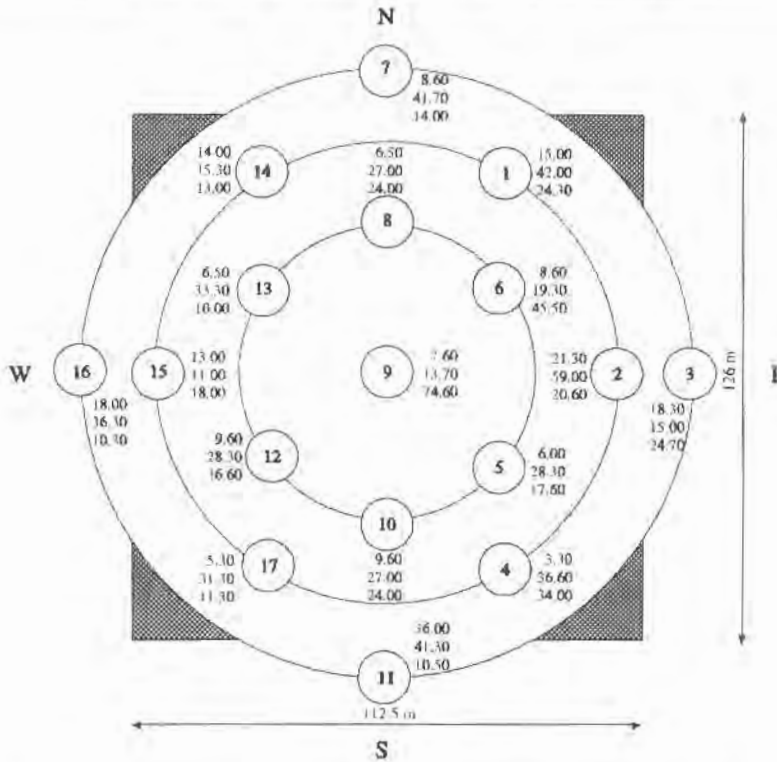


Fig.1. The loci of setting up of Petri-cups and the order of sedimentation method application to the sowing of the nutritional bases

Sl. 1. Mesta postavljanja Petri-šolja i redosled izvođenja sedimentacione metode zasejavanja hranljive podloge

RESULTS AND DISCUSSION

Statistical analysis has shown that the number of fungi (tab.1) in the vine orchard was the highest under the conditions of increased temperature (21,7°C) wind speed (306 m/sec), but lowered air humidity (48) (tab.2), which was, excepting central sector (part) of the orchard, observed in the afternoon hours. Obviously, at the time of base sowing (different periods of the day) abiotic factors (environmental conditions) differently affected the onset (number) of fungi, which is in agreement with results of numerous authors (Simordonova, 1977; Gambale et al., 1981, 1983).

Tab.1. Daily variations in the number of fungi in the air of vine orchard
Dnevno variranje brojnosti gljiva u vazduhu zasada vinove loze

	N	I	S	W	\bar{x}_I
I	8,60 j.	18,30	36,00	18,00	20,22
	41,70 p.	15,00	41,30	36,30	33,57
	14,00 v.	24,70	10,50	10,30	14,87
					\bar{x}_{II}
II	14,50 j.	21,30	4,30	13,00	13,27
	28,65 p.	59,00	33,95	11,00	33,15
	18,65 v.	20,60	22,65	18,00	19,97
					\bar{x}_{III}
III	6,50 j.	7,30	9,60	8,05	7,86
	27,00 p.	23,80	27,00	30,80	27,15
	24,00 v.	31,55	24,00	23,30	25,71
					$\bar{x}_{I,II,III}$
$\bar{x}_{I,II,III}$	9,86 j.	15,63	16,63	13,01	13,78
	32,45 p.	32,60	34,08	26,03	31,29
	18,88 v.	25,62	19,05	17,20	20,18
IV	7,60 j.				
	13,70 p.				
	24,60 v.				

The highest number of the fungi in the morning (16-63) and afternoon (34,08) hours was reported to be on the southern (S), and that occurring in the evening (35,62) hours on the eastern part of the orchard (I).

With an exception to the morning hours on the northern (9,86) and evening ones on the southern side of the orchard (19,05), the highest number of fungi during all the three periods of the day was reported on the southern (S), and the lowest one on its western (W) side (tab.1)

In contrast to the evening hours, during the morning and afternoon ones, the fungi were noticed to decrease in number from the periphery to the center of the orchard, which may have some connection with a phytocidal impact of the plants themselves. Such effect is corroborated with similar results obtained by other authors (Tkacenko et al. 1985).

Tab.2. The values of basic abiotic factors at the time of setting up of the trial

Vrijednosti osnovnih abiotičkih faktora u vreme postavljanja ogleda

Hours	temperature (°C)	relative humidity (%)	pressure (mb)	wind (m/s)
6,30	16,00	59	1012	1-1.5
12,30	21,70	48	1012	3-5
18,30	20,00	59	1011	/

- Morning, sunny
- Noon, half-sunny
- Evening, cloudy

CONCLUSION

Based on studies on the daily dynamics of the number of fungi in the air of vine orchard at the existing environmental conditions, the following may be inferred:

- the number of fungi was the highest under the conditions of increased temperature and wind speed and decreased relative air humidity, i.e. in the afternoon hours, and the lowest under those of lowered temperature and wind speed and increased relative air humidity, i.e. in the morning ones;
- the highest number of fungi in the morning and afternoon hours was reported to be on the southern and, that occurring in evening hours, on the eastern side of the vine orchard;
- during all the three periods of the day, the number of fungi was mainly highest on the southern and lowest on the western orchard's side, and
- during the morning and afternoon hours, the number of fungi decreased from the periphery towards the center of the orchard, which indicated a phytocidal plant effect.

REFERENCES

- Dunskij, V.F. (1982): Aeromikrobiologija i prognoziranje bolesti rastenij. V knj. - Aeromikro-biologija u zaštite rastenij. Moskva, Kolos, 1982, s. 166-190.
- Dukić, D., Mandić, L., Gutić, M. (1999): Mikrobiološki uslovi intramularnih prostora za gajenje stoke i peradi. Zimska škola za agronome, Zbornik radova, Vol. 3, No.3, s. 191-200.

- Firpi, M., Cervio, G., Rizzi, E. (1981): Phytocenolitic protection measures to be taken against expansion of infection. *Cartotech. e imball*, 1981, 1, No 2, p. 33-38.
- Gambale, W., Purchio, A., Rodrignes, P.C. (1981): Aerogenous dunger to be predicted for plant protection. *Rev. Microbiol.*, 1981, 12 No 4, p. 176-181.
- Gambale, W., Purchio, A., Rodrignes, P.C. (1983): The Role of Meteorological Factor in the Prediction of Plant Disease. *Rev. Microbiol.*, 1983, 14 No 3, p. 204-214.
- Lidemann, J., Constantinidou, H.A., Barchet, W.R. (1982): Atmosphere-an important chain in proliferation of microorganisms. *Appl. Environ. Microbiol.*, 1982, 44, No. 5, p. 1059-1063.
- Nemiro, V.I., Vlodavec, V.V. (1979): *Ohrana okružajušćej sredi ot vibrosov predpriyatij mikrobiologičeskoj promislenosti*: Moskva, Medicina, 1979, 142 s.
- Simordova, M. (1977): Aerosolic Expansion of the fungus spores. *Ložarstvi*, 1977, 27, N: 5, p. 124-126.
- Tkačenko, V.I., Džuban, I.N., Čimanova, A. (1985): V sb.: *Introdukcija i aklimatizacija dnevesnih, kustarnikovih i plodovih rastenij*, Franze, 1985, s. 40-48.

**PROSTORNO I DNEVNO VARIRANJE BROJNOSTI GLJIVA
U VAZDUHU ZASADA VINOVE LOZE**

Dragutin Đukić, Leka Mandić, Agronomski fakultet, Čačak
Zora Vučinić, Velibor Spalević, Tatjana Papić,
Biotehnički institut, Podgorica,
Svetlana Nikčević, dipl. biolog, PMF, odsjek za biologiju, Podgorica

Sažetak

S obzirom da je prenošenje različitih izazivača (ili njihovih prenosilaca) oboljenja biljaka vazdušnim putem veoma važna karika u širenju fitopatogenih mikroorganizama, mi smo se opredelili za praćenje prostorne dinamike brojnosti gljiva u vazduhu zasada vinove loze, što u sistemu ostalih mera može doprineti preduzimanju adekvatnih mera njegove zaštite.

Selektivna hranljiva podloga za gljive (Čapekov agar) zasejavana je sedimentacionom metodom u jutarnjim, podnevnim i večernjim časovima u postojećim meteorološkim uslovima.

Konstatovano je da je brojnost gljiva u vazduhu najveća u uslovima povećane temperature i brzine vetra i snižene relativne vlažnosti vazduha, dakle u podnevnim satima, a najmanja u uslovima snižene temperature i brzine vetra i povećane relativne vlažnosti vazduha, t.j. u jutarnjim satima. Najveća brojnost gljiva u jutarnjim i podnevnim satima bila je na južnom a u večernjim satima na istočnom delu zasada. U sva tri doba dana brojnost gljiva je, uglavnom, bila najveća na južnoj, a najmanja na zapadnoj strani zasada. Tokom jutarnjih i podnevnih sati brojnost gljiva se smanjivala od periferije prema centru zasada, što ukazuje na fitoncidno dejstvo biljaka.