

Preliminary observations on the occurrence of *Ciboria batschiana* (Zopf) Buchwald in the Czech Republic

Z. Prochazkova¹, A. Sikorova¹ and V. Peskova²

¹Forestry and Game Management Research Institute, Research Station Uherske Hradiste, 686 04 Kunovice, Czech Republic. E-mail: prochazkova@vulhmuh.cz

²Forestry and Game Management Research Institute, Jiloviste-Strnady 156 04 Praha 5-Zbraslav, Czech Republic

The paper presents preliminary results on the occurrence of *Ciboria batschiana* (Zopf) Buchwald, in the Czech Republic, on acorns collected from the forest floor or from nets suspended above the forest floor for the years 2000–2002. The highest incidence of *C. batschiana*, but also the highest average germination and moisture content, was found on acorns collected in 2001, while the lowest number of infected samples were found in the 2000 crop. *Ciboria* infection of acorns differed by year of collection and by forest stand. There appears to be a positive relationship between the amount of acorn infection and abundance of rain in September of the collection year. Infection also occurred on acorns collected from nets suspended above the forest floor, but infection was lower than for acorns collected from the forest floor.

Introduction

Ciboria batschiana (Zopf) Buchwald. [syn. *Sclerotinia pseudotuberosa* Rehm, anamorph *Myrioconium castanae* (Bainier) Morelet] is an Ascomycete fungus causing “black rot -mummification” of acorns of *Quercus* spp. This specialised parasite of *Quercus* and *Castanea sativa* seeds was described in 1878 by Zopf and in 1879 by Rehm (Dennis 1956) who later pointed out the risk (threat) to natural reforestation of oaks by this pathogen in Germany (Rehm 1989). Klika (1923) was the first to report the occurrence of the pathogen in Czechoslovakia. Initially research was oriented towards mycological studies, but since the 1960’s the economic importance of stored seeds of sweet chestnut and oaks has been taken of prime importance. Urosevic (1957, 1961) reported up to 60 % of stored acorns were destroyed in 1955 and 1956 in Czechoslovakia. Later, in 1973 and 1974, about 90% of acorns stored for 3–8 months were killed by *C. batschiana* in France (Delatour et al. 1980). In the Czech Republic it is a common practice to sow acorns after their collection in the autumn and only a small amount of acorns are stored for one or more winters. However, from time to time the autumn sown acorns are damaged (mostly by abiotic factors; Procházková 1994) so the storage of certain quantities of acorns seems to be necessary. *Ciboria* spreads from affected to unaffected acorns even at low temperatures (-1 °C), thus the entire acorn crop may be destroyed during the first winter of storage (Urosevic 1956). Ascospores

of the fungus can quickly infect acorns after they fall to the forest floor in the autumn (Neff and Perrin 1999), but also acorns on trees can be infected (Stocka 1994). The only effective control of black rot is hot water treatment (thermotherapy) of acorns which kills the fungus, but not the acorns (Neff and Perrin 1999). However, we have no information about the occurrence of infection in different crop years and different forest stands. Also, if acorns are infected mainly after their fall to the forest floor the use of nets suspended above the floor could decrease or prevent acorn infection.

The goals of research project QD0173 “Factors influencing quality of beechnuts and acorns during storage” are to determine the occurrence of *C. batschiana* on acorns of oaks (*Quercus*) in the Czech Republic in different years and the effect of collection method (forest floor versus nets suspended above the floor). This paper presents preliminary results of this research.

Materials and methods

Acorns of different oak species were collected either directly from forest floor or from nets suspended below trees (to prevent the acorns from coming into contact with the forest floor) in oak stands around the country. In 2000, acorns also were collected on two dates from seven forest stands (Table 1). The occurrence of *C. batschiana*, other fungi and insect infestation was determined for acorns incubated in wet chambers (Petri dishes with 3 layers of filter paper) at kept at 15 (± 2) °C for a maximum of 2 weeks. Moisture content (fresh weight basis) and germination (done together with health tests) of the acorns was also determined.

Table 1. Number of samples and collection technique in different years: Acorns of *Quercus robur*, *Q. petraea*, *Q. cerris*, *Q. rubra* and *Q. pubescens* were collected from early September to late October in 2000¹; acorns of *Q. robur*, *Q. petraea* and *Q. rubra* from late September to early November in 2001 and 2002.

	2000	2001	2002
Total number of samples	100	62	47
Number of samples collected from forest floor	100	52	47
Number of samples collected from nets	None	10	None

¹ Two collection dates in seven stands.

Results and discussion

The highest incidence of *Ciboria batschiana*, but also the highest average germination and moisture content, was found on acorns collected in 2001, while the lowest number of infected samples were found in the 2000 crop (Fig. 1). The level of acorn infection with *C. batschiana* coincides with weather, especially precipitation in September. More rainfall occurred in 2001 than in 2000 and 2002 (Fig. 2) which facilitated the development of *C. batschiana* fruiting bodies and the

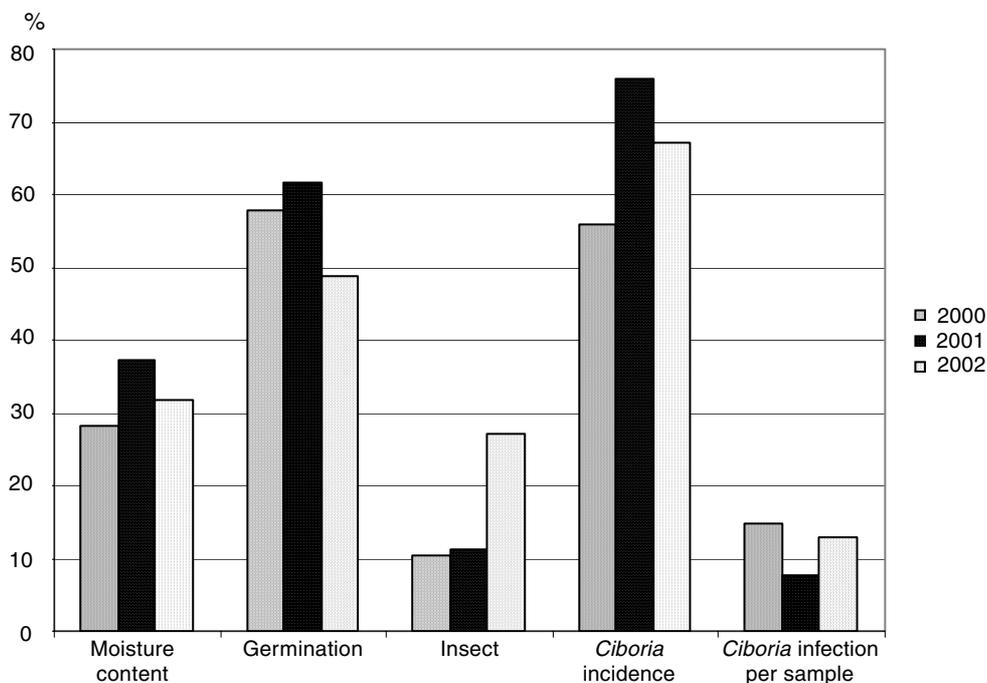


Figure 1. Overall quality of acorns collected in different years.

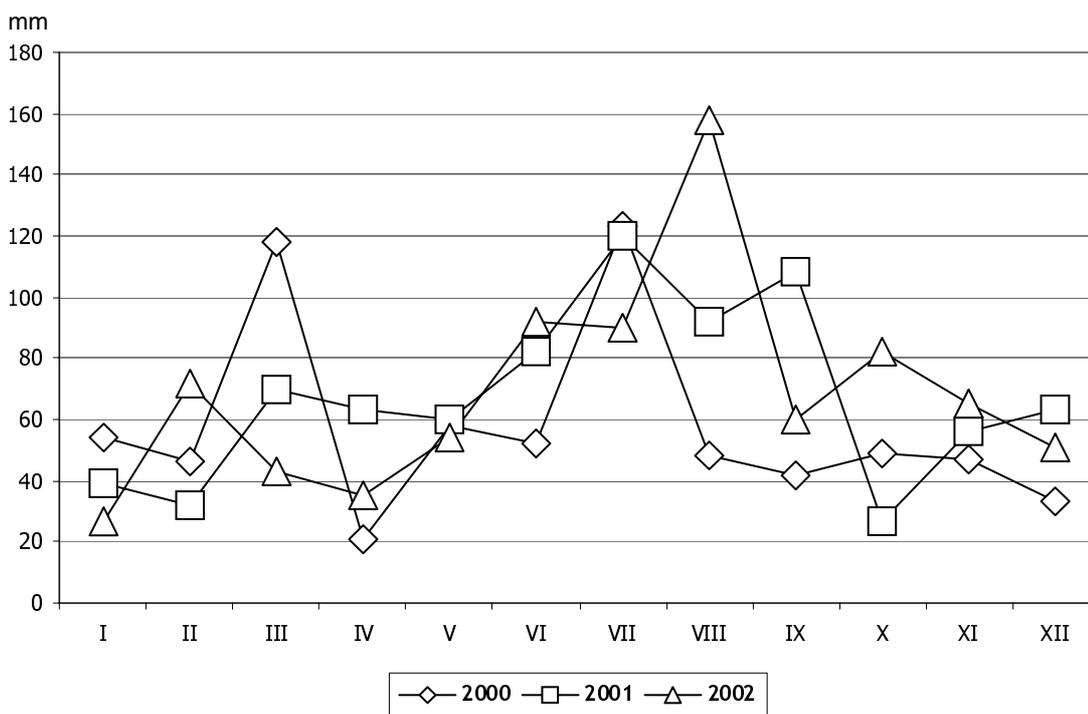


Figure 2. Average month precipitation in the Czech Republic during the study.

production and dispersal of ascospores, and consequently the infection of maturing acorns. In 2000, acorns matured and fell to the ground from early September to late October when both months were dry (about 50 mm of precipitation; Fig. 2). In 2001, acorn maturation was later than for the 2000 crop, i.e. maturation occurred in late September, October and early November. September was very wet (Fig. 2) and the conditions for development of *C. batschiana* were the best of all three collection years. Precipitation in 2002 was similar to 2000 but acorns matured later. The infection of acorns with *C. batschiana* varies depending on climatic conditions. In France in 1976 nearly total absence of fructification of *C. batschiana* was recorded because of dry weather even when the massive acorn crop in 1974 created favourable conditions for pathogen sporulation (Delatour and Morelet 1979).

Numbers of infected acorns from different, and in some cases adjacent, stands differed (Fig. 3). This finding supports the necessity of not mixing acorn collections from individual stands. Further supporting this practice is the suggestion by Delatour and Morelet (1979) that certain geographic areas might be more suitable for the pathogen.

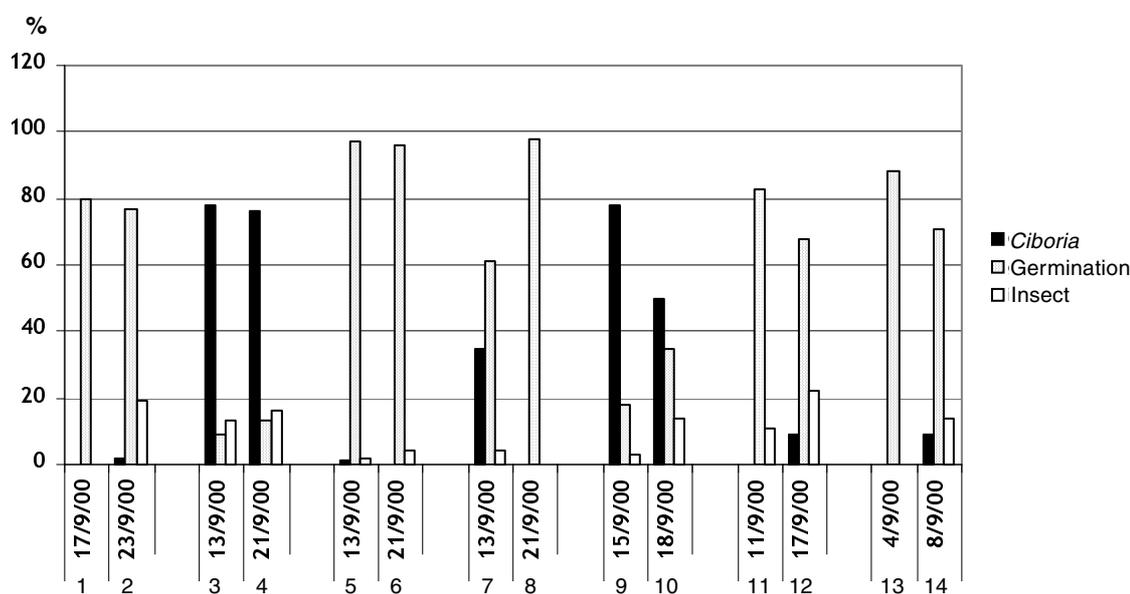


Figure 3. *Ciboria* infection of acorns from the seven stands and two collection dates in September 2000. Samples: 1=207D10; 2=207D10; 3=207D15; 4=207D15; 5=212A15; 6=212A15; 7=212B14; 8=212B14; 9=307D11; 10=307D11; 11=308B10; 12=308B10; 13=312B12; 14=312B12

The highest infection was in acorns collected in stands of the same forest unit during September, 2000, specifically from about September 10 to September 20 (Fig. 4). However, infection varied among stands and collection dates.

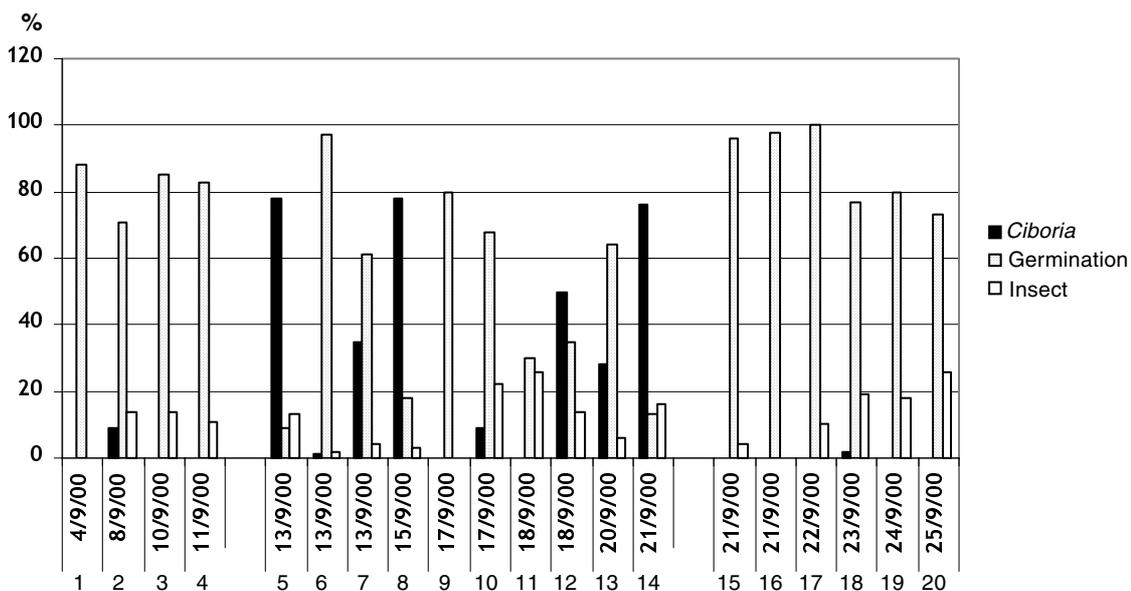


Figure 4. *Ciboria* infection of acorns from different stands of the same forest unit in September, 2000. Samples: 1=312B12; 2=312B12; 3=212A9; 4=308B10; 5=207D15; 6=212A15; 7=212B14; 8=307D11; 9=207D10; 10=308B10; 11=211C12; 12=307D11; 13=306A9; 14=207D15; 15=212A15; 16=212B14; 17=206A11; 18=207D10; 19=217D13; 20=312A17

In forest stand 207 D15 with the highest *Ciboria* incidence in 2000 (Fig. 5), acorns were collected both from the forest floor and from nets in 2001. In total, the level of infection on acorns was higher for the 2000 crop than that for the 2001 crop. In 2001, acorns matured about a month later and perhaps this was the reason for the very low infection level. However, acorns collected by both techniques (i.e. from the forest floor and from nets) were infected with *Ciboria* even though the level of infection was higher on acorns from the forest floor. This confirms the finding of

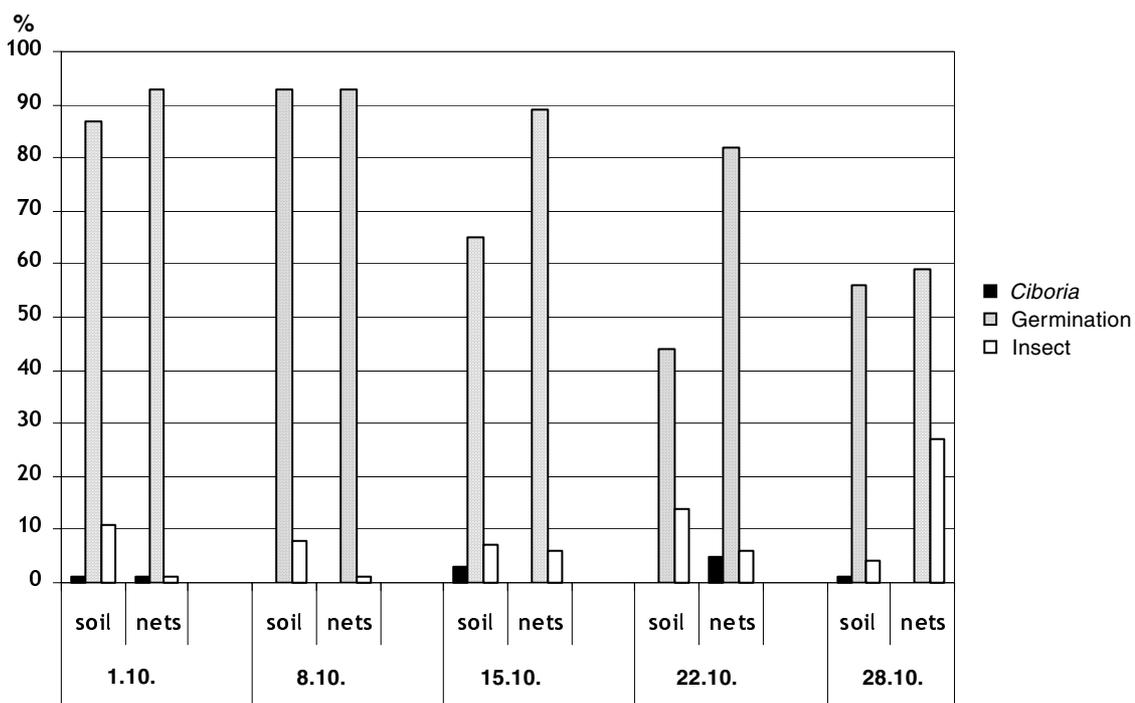


Figure 5. Quality of acorns collected from the forest floor and suspended nets in October, 2001, in Buchlovica, stand 207D 15.

Stocka (1994) that acorns on trees (before they are shed) can be infected by *Ciboria*. However, the use of nets for acorn collection can decrease pathogen infection but not prevent it.

Conclusions

1. *Ciboria* infection of acorns differs by year of collection and by forest stand.
2. There appears to be a positive relationship between the amount of acorn infection and abundance of rain in September of the collection year.
3. Infection also occurs on acorns collected from nets suspended above the forest floor, but infection was lower than for acorns collected from the forest floor.

Acknowledgements

We thank the technicians at the Laboratory for Seed Testing at the Research Station Uherske Hradiste for providing excellent laboratory assistance and Dr. J. R. Sutherland for reviewing the manuscript. These preliminary results are from research project QD0173 “Factors influencing quality of beechnuts and acorns during storage” granted by the National Agency for Agricultural Research and funded by Ministry of Agriculture of the Czech Republic.

References

- Delatour, C., & Morelet M. 1979. La pourriture noire des glands. Rev. For. Fr. 18:101–115.
- Delatour, C., Muller, C. & Bonet-Masimbert, M. 1980. Progress in acorn treatment in a long term storage prospect. In: Proc. IUFRO Int. Symp. Forest Tree Storage, PNFI, Ontario, Canada. p. 126–133.
- Dennis, R.W.G. 1956. A revision of the British Helotiaceae in the herbarium of the Royal Botanic Gardens, Kew, with notes on related European species. Mycological Papers. (62): 138–139.
- Klinka, J. 1923. Z biologie a ekologie hlízenek. (Biology and ecology of *Sclerotinia*). Veda prirodni 4:145–147, 201–204.
- Procházková, Z. 1994. Abiotic damage of fall sown acorns in forest nurseries in the Czech Republic. Pages 113–115. In: Diseases and insects in forest nurseries. R. Perrin and J.R. Sutherland (eds). Dijon (France), October 3–10, 1993. Les Colloques n°68. INRA, Paris. p. 113–115.
- Procházková, Z. 1995. Mykoflóra zaludu (Literární přehled). Mycoflora of acorns. (A literature review.) Zprávy lesn. výzkumu 40: 3–5.
- Stocka, T. 1994. Najwazniejsze zagadnienia fitopatologiczne w 1993 r. (The most important phytopathological problems in 1993). Las Polski 9: 22–23.
- Urosevic, B. 1956. Výskyt cerne hniloby zaludu v Ceskoslovensku. (Occurrence of black decay of acorns in Czechoslovakia). Lesnická práce 35: 420–426.
- Urosevic, B. 1957. Mykoflóra skladovaných zaludu. (Mycoflora of stored acorns). Práce VÚL ÈR 13: 149–200.
- Urosevic, B. 1961. Mykoflóra zaludu v období dozrávání, sberu a skladování. (Mycoflora of acorns during maturation, collection, and storage). Práce VÚL CR 21: 81–203.