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An investigation of the date of sooty blotch primary infection and duration of incubation period for selected apple cultivars

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ABSTRACT

The experiments were conducted in the years 2000 – 2002 in Garlica near Kraków and Łososina Dolna near Nowy Sącz on the apple cultivars 'Florina', 'Novamac', and 'Witos'. The date of primary infection by fungi causing sooty blotch was determined in unsprayed orchards. It was found that the date of infection was different for various regions under investigation. The infection occurred primarily in late June and early July. The earliest infection was recorded for the 'Novamac' cultivar. In the Łososina Dolna area the infection occurred earlier due to higher relative air humidity and rainfall. The duration of incubation period was also diversified for cultivars examined in both locations. The shortest period (29 days) was observed for 'Novamac' in Łososina Dolna, while the longest one (45 days) for 'Florina' in Garlica. It was found that the earlier date of primary infection, the shorter incubation period.

INTRODUCTION

Sooty blotch is a disease that frequently occurs throughout the apple growing areas in the world. In recent years the disease develops also in poorly sprayed apple orchards in Poland. As follows from research studies the disease is not caused by *Gloedes pomigena* (Colby) mentioned in phytopathological literature. It is commonly believed (Johnson 1994, Wrona 2003) that sooty blotch is caused by such fungi species as *Phialophora sessilis* (De Hoog), *Tripospermum myrti* (Lind. Hughes), *Peltaster fructicola* (Jonhson). Although the pathogen development cycles have not been described yet in detail, it is known that fungi causing sooty blotch overwinter in the form of mycelium and pycnidium on twigs of numerous forest trees (Williamson and Sutton 2000). Johnson at al. (1997) claim that twigs are the key source of primary infection. The first infection in May occurs during petal fall (Hickey et al. 1958, Brown and Sutton 1993). Olive-grey spots appear on the fruit and may cover a large part of the surface of apple fruit. The degree of infestation depends not only on weather conditions but also to a large extent on the date of infection (Brown and Sutton 1995). The aim of this paper was to determine the date of primary infection in selected areas of southern Poland and to establish the duration of incubation period.

MATERIAL AND METHODS

The experiments were carried out in the years 2000 – 2002 on apple cultivars ‘Florina’, ‘Novamac’, and ‘Witos’ in unsprayed orchards in Garlica near Kraków and Łososina Dolna near Nowy Sącz. The locations were chosen on the basis of previous studies that indicated considerable differences both in average relative air humidity and average daily rainfall. The values of these parameters were calculated for the period of observations lasting from the date of primary infection to the date when first lesions were found. To determine the date of primary infection and duration of incubation period 15 trees were chosen for each apple cultivar. Every two days 25 fruits were taken at random for each cultivar and then placed separately in wet chambers. The date of primary infection was determined when the first symptoms of sooty blotch in the form of olive-grey spits were found. The duration of incubation period was defined as time interval between the date of primary infection and the date when the first lesions (pale olive spots) were observed on fruits in the orchard.

RESULTS AND DISCUSSION

The experiments have indicated that during the years under consideration the primary infection occurred in both locations between 27th June and 7th July (Table 1). In 2000 the earliest infection was observed on 28th June in Łososina Dolna for 'Novamac'. Secondary infections on 'Florina' and 'Witos' were observed 5 days later (3rd July). In the second location (Garlica) two apple cultivars ('Florina', 'Novamac') were infected 2 to 3 days later than those of Łososina Dolna. Only the fruits of 'Witos' were infected on the same day (3rd July). The earliest date of infection was also observed for 'Novamac'. In 2001 the earliest primary infections occurred on 27th June on 'Novamac' in Łososina Dolna. In this location other apple cultivars became infected 1 – 2 days earlier than in Garlica. In both locations the earliest infection was observed on 'Novamac'. In 2002 the apple fruits in Łososina Dolna were also infected earlier than those of Garlica. The infection on 'Witos' occurred on 30th June, and 1 day later on 'Novamac'. In Garlica infection occurred from 2 to 6 days later. The observed differences between locations resulted from different weather conditions. The Łososina Dolna area is characterized by higher relative air humidity and rainfall during the growing season (Tables 2, 3, and 4). In particular, higher rainfall is favourable for pathogen growth and earlier colonisation of the fruits (Johnson and Sutton 2000). When determining the duration of incubation period under field conditions some considerable differences between two locations under investigation were found in individual years. In the years 2000 – 2002 a considerably shorter incubation period was recorded for each cultivar in Łososina Dolna. In 2000 this period varied from 31 days for 'Novamac' to 37 days for 'Florina' (Table 2). In Garlica the incubation period was longer by 8–9 days for each cultivar under consideration. In 2001 the incubation period was slightly shorter for each cultivar in both locations. The shortest one (29 days) was recorded for 'Novamac' in Łososina. This resulted from higher rainfall and relative humidity during that growing season. Such conditions stimulated the pathogen growth and lead to shorter sooty blotch incubation period (Table 3). Also, in 2002 the shortest incubation periods were observed in Łososina Dolna: 'Florina' – 37 days, 'Novamac' – 33 days and 'Witos' – 31 days. In Garlica for the same cultivars the lesions were observed after 43, 39, and 40 days after infection, respectively (Table 4). For cultivars under investigation some differences in the date of primary infections were found in each location. Brown and Sutton (1993, 1995), Johnson (1994), Johnson and Sutton (2000), and Sharp and Yoder (1985) showed that the duration of sooty blotch incubation period depended primarily on rainfall in the July – September period. This was confirmed by the present study that indicated a considerably shorter incubation period in the area of higher relative air humidity and rainfall. It was also found that the earlier date of infection, the shorter incubation period.

Table 1. The date of primary infection by fungi causing sooty blotch on selected apple cultivars in the years 2000 – 2002

Year of observation	Cultivar					
	Garlica			Łososina Dolna		
	'Florina'	'Novamac'	'Witos'	'Florina'	'Novamac'	'Witos'
2000	5.07	1.07	3.07	3.07	28.06	3.07
2001	2.07	29.06	3.07	1.07	27.06	1.07
2002	7.07	3.07	5.07	4.07	1.07	30.06

Table 2. The duration of sooty blotch incubation period depending on rainfall and relative humidity in the growing season 2000

Location	Incubation [days]			Average daily rainfall [mm]	Relative humidity [%]
	'Florina'	'Novamac'	'Witos'		
Garlica	45	39	43	3.8	71.2
Łososina Dolna	37	31	34	5.6	74.8

Table 3. The duration of sooty blotch incubation period depending on rainfall and relative humidity in the growing season 2001

Location	Incubation [days]			Average daily rainfall [mm]	Relative humidity [%]
	'Florina'	'Novamac'	'Witos'		
Garlica	43	37	41	4.6	72.8
Łososina Dolna	35	29	34	6.2	74.9

Table 4. The duration of sooty blotch incubation period depending on rainfall and relative humidity in the growing season 2002

Location	Incubation [days]			Average daily rainfall [mm]	Relative humidity [%]
	'Florina'	'Novamac'	'Witos'		
Garlica	43	39	40	2.9	71.8
Łososina Dolna	37	33	31	4.8	74.3

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BADANIA NAD OKREŚLENIEM TERMINU INFEKCJI PIERWOTNEJ ORAZ DŁUGOŚCI OKRESU INKUBACJI BRUDNEJ PLAMISTOŚCI JABŁEK U WYBRANYCH ODMIAN

Streszczenie: Badania przeprowadzono w latach 2000 – 2002 w Garlicy koło Krakowa oraz Łososinie Dolnej koło Nowego Sącza, na drzewach jabłoni odmian ‘Florina’, ‘Novamac’, ‘Witos’. W sadach nie objętych chemiczną ochroną określano termin infekcji pierwotnej grzybów wywołujących brudną plamistość jabłek. Stwierdzono zróżnicowanie w terminie infekcji u badanych odmian oraz w poszczególnych regionach. Wykazano, że do zakażeń dochodzi najczęściej na przełomie czerwca i lipca. Najwcześniej porażane były owoce odmiany ‘Novamac’. Wcześniej do zakażeń dochodziło w rejonie Łososiny Dolnej, gdzie była wyższa wilgotność względna powietrza oraz większa ilość opadów deszczu. Okres inkubacji był również zróżnicowany u badanych odmian w obydwu miejscowościach. Najkrótszy był u odmiany ‘Novamac’ w Łososinie Dolnej i wynosił 29 dni, a najdłuższy 45 dni u odmiany Florina w Garlicy. Wykazano, że im wcześniej dochodzi do zakażeń to okres inkubacji jest krótszy.

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