Romanian Journal for Plant Protection, Vol. VII, 2014
ISSN 2248 – 129X; ISSN-L 2248 – 129X

Susceptibility evaluation of apple leaves against *Venturia inaequalis* infection

Viorel Fătu [1,2*], *Roxana Dudoiu* [1,2], *Carmen Lupu* [1]

[1] Research - Development Institute for Plant Protection, Bucharest, Romania
[2] University of Agronomic Science and Veterinary Medicine, Bucharest, Romania

[*] correspondence address
Research-Development Institute for Plant Protection
Bd. Ion Ionescu de la Brad nr. 8, CP 013813, S 1,
Bucharest, ROMANIA
Tel.: 004-021-2693231 (32, 34)
Fax.: 004-021-2693239
e-mail: fatu_viorel@yahoo.com

Abstract

Plants grown in the field are subjected to variable environmental conditions during their life cycle. When environmental conditions become extreme, cellular metabolism is diverted from its normal course in the direction of short-term negative effects attenuation. Intense solar radiation associated with high temperatures determines acceleration of water transport in the plant in order to be evaporated. The purpose of this study is to test the susceptibility of apple leaves against *Venturia inaequalis* infection according to the canopy sun exposure. In July 2012, 20 apple trees (25 years age) were selected from which were randomly collected 200 leaves on the north side of the canopy and 200 on the south. Degree of attack using Assess 2.0 program, the amount of chlorophyll a and chlorophyll b using the CCM-200 plus device and ash content using a calciner, were determined. The degree of leaves infection with *V. inaequalis* was 4.16% for southern exposition and 1.21% for the northern exposition. The total amount of chlorophyll was 3.25 mg/g FM (fresh matter) for the leaves with southern exposition and 4.51 mg/g FM for those with northern exposition. After calcination of 5 grams of leaves at 550 °C, the percentage of ash was 4.06% for the leaves with northern exposition and 4.56% for the leaves with southern exposition. The results showed a strong correlation between the attack degree of *V. inaequalis* and intensive solar radiation absorbed by leaves.

Key words: *Venturia* susceptibility, solar radiation, chlorophyll

INTRODUCTION

Venturia inaequalis is the pathogen that causes apple (*Malus* spp.) scab. In Romania the disease is widespread in all apple orchards and cause production losses between 30 and 98% (Şuta et al.,1974)[1]. The infection is localized mainly on leaves and fruit when atmospheric air relative humidity exceeds 60-70% over a period of at least nine hours at temperatures between 18 and 26ºC[2]. Since the leaf epidermal cells are covered with a variable protective layer (cuticle), the forecast infection rate using temperature and humidity may differ from the actual infection rate. This variable protection is dependent on the host plant genome, but could be influenced by other external factors. The proposed factor in this paper is the relative position of the plant canopy to the sun light direction.

MATERIALS AND METHODS

Apple leaves were collected randomly from the southern part and the northern part of the canopy at different heights from 25 years age trees on 20 July 2012.
Determination of attack degree was performed by analysis of scanned images using Assess 2.0 software (Figure 1).The whole assembly PC, scanner CanoScan LiDE 210 and Assess 2.0

was successfully verified in terms of results repeatability. Verification was performed by reading the attack degree of five leaves ten times in different parts of the scanner.

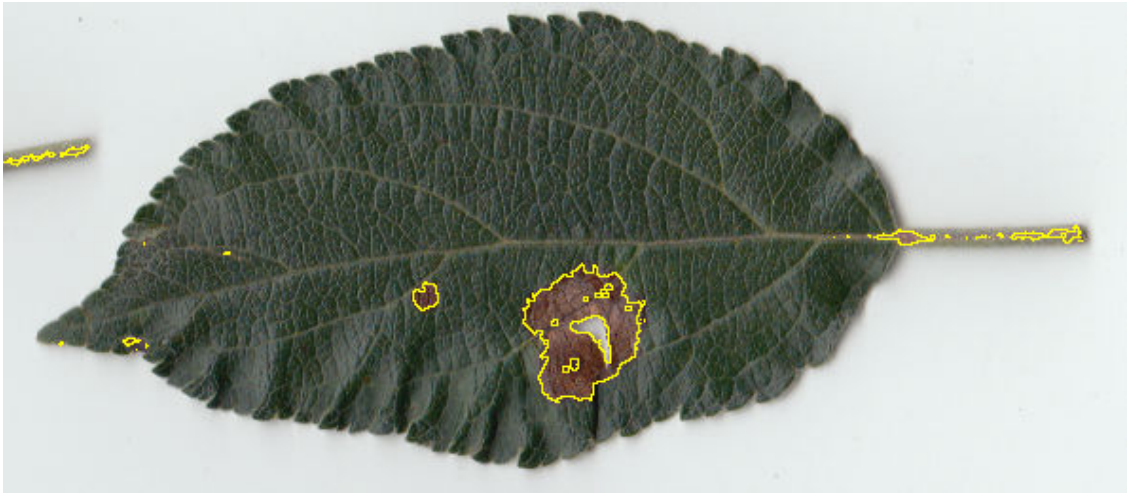

Figure 1. Determination of attack degree

Chlorophyll content (Figure 2) was determined with CCM-200 plus device (Figure 3), calibrated with transformation equation (Table 1) of CCI (Chlorophyll Content Index) in mg/g FM (Fresh Matter). CCI transformation equation in mg/g was performed using BioStat 2009 software and chlorophyll content data of nine analyzed samples by classical method (85% acetone extraction) and related CCI values.

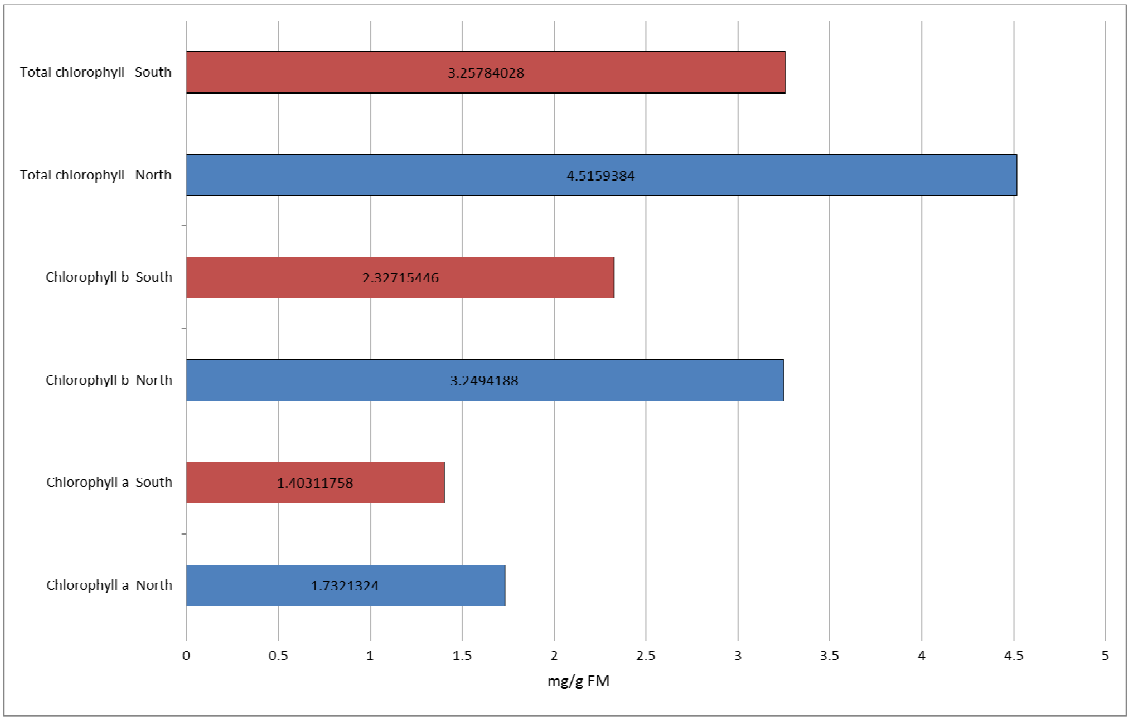

Figure 2. Chlorophyll content

Figure 3. CCI determination

Water content of fresh leaves was gravimetrically determined with Partner Mac 50 / NH thermobalance. Ash content of the leaves was achieved by calcination at 550°C.

RESULTS AND DISCUSSIONS

- The degree of leaves infection with *V. inaequalis* was 4.16% for southern exposition and 1.21% for the northern exposition.
- The total amount of chlorophyll was 3.25 mg/g FM for the leaves with southern exposition and 4.51 mg/g FM for those with northern exposition.
- Water content was 8% higher for the leaves with northern exposition.
- After calcination of 5 grams of leaves at 550°C, the percentage of ash was 4.06% for the leaves with northern exposition and 4.56% for the leaves with southern exposition.
- The results showed a strong correlation between the attack degree of *V. inaequalis* and intensive solar radiation absorbed by leaves.
- By analyzing the amount of ash, leaves with southern exposition lost more water through evaporation to maintain a low temperature and accumulated more minerals, which have changed the pace of organic matter accumulation.

CONCLUSIONS

Leaves with southern solar exhibition had an attack degree of almost four times stronger.
Chlorophyll content was significantly lower in leaves exposed to the south (Tukey's Multiple Comparison Test - ***).
Ash content was higher in leaves that intercepted more solar radiation.

ACKNOWLEDGEMENTS

Work resulting from project Nucleu 40/2009 - “Forecast and identify emerging risks in plant crops” funded by ANCS, Ministerul Educatiei, Cercetarii, Tineretului si Sportului.

REFERENCES

1. http://www.statiuneabaneasa.ro/plante/boli.php?id=6
2. Vaillancourt, L.J. and J.R. Hartman. 2000. Apple scab. The Plant Health Instructor. DOI: 10.1094/PHI-I-2000-1005-01 Updated 2005.
3. https://www.apsnet.org/apsstore/shopapspress/Pages/43696m5.aspx
4. Richardson A.D., Duigan S.P. and Berlyn G.P., 2002 - An evaluation of noninvasive methods to estimate foliar chlorophyll content, *New Phytologist* 153 : 185–194.

Table 1

Linear regression equations

Regression statistics	Chlorophyll a	Chlorophyll b	Total chlorophyll
R	0.788	0.896	0.917
R square	0.621	0.803	0.841
Equation: mg/g FM =	0.6616+0.0193*CCI	0.2486+0.0541*CCI	0.4224+0.0738*CCI