Bulletin UASVM Horticulture, 69(1)/2012
Print ISSN 1843-5254; Electronic ISSN 1843-5394

Reducing Primary Inoculum of Apple Scab Using Foliar Application of Urea in Autumn

Viorel MITRE[1)], Ioana MITRE[1)], Adriana F. SESTRAS[2)], Ciprian PETRISOR[1)], Radu E. SESTRAS[1)]

[1)] University of Agricultural Sciences and Veterinary Medicine, Faculty of Horticulture, 3-5 Manastur Street, Cluj-Napoca 400372, Romania; mitreviorel@yahoo.com.
[2)] Fruit Research Station, 3-5 Horticultorilor St., Cluj-Napoca 400454, Romania; asestras@yahoo.com.

Abstract. The effect of applications of urea 5% after harvest but before leaf-fall, as foliar application, in order to restrict perithecial production by *Venturia inaequalis* in a commercial super intensive apple orchard situated near Cluj-Napoca, Romania was studied. The urea works in two ways: directly by inhibiting the development of ascospores, and by stimulating the development of antagonistic microorganisms from against *V. inaequalis*. There are several possibilities to reduce the amount of overwintering apple scab, such as removing fallen leaves by raking, vacuuming, or using leaf blowers, chopping or shredding the leaf litter in the spring. Primary infection of scab conidia is produced by infected leaf litter on the orchard floor. Any modalities that reduce the amount of leaf litter will help to reduce the amount of inoculum for primary infection with scab. Urea-treated leaves decomposed rapidly infected leaf litter, thus destroying the overwintering substrate for the *V. inaequalis* fungus. The results have shown large reductions in spore production, often as high as 70 to 80%, following application of 5% urea. Spraying the surface of the leaves on the ground with urea 5% reduced primary infection by about 60%. In conclusion, urea applications proved to be effective to reduce apple scab inoculum. Combining the urea with other modalities of leaf shredding provides the greatest reductions in ascospores.

Keywords: urea, apple scab, leaf litter, fungus, inoculum

Introduction. *Venturia inaequalis* causal agent of apple scab is the most important disease of apple and its control depends almost exclusively on frequent use of fungicides. In apple production, 75% of the used pesticides are related to control of fungal diseases, in which apple scab has a share of 70% (Creemers and Laer, 2006). In order to reduce the incidence of apple scab there are several sanitation practices in the specialty literature (Holb, 2007) as ploughing, shredding of leaf litter, leaf collection, urea application (Burchill *et al*. 1965; Burchill, 1968). There are several possibilities recommended to reduce the amount of over wintering apple scab such as removing fallen leaves by raking, vacuuming, or using leaf blowers, chopping or shredding the leaf litter in the spring. Primary infection of scab conidia is produced by infected leaf litter on the orchard floor. Any modalities that reduce the amount of leaf litter will help to reduce the amount of inoculum for primary infection with scab. Urea-treated leaves decomposed rapidly, infected leaf litter, thus destroying the over wintering substrate for the *V. inaequalis* fungus.

Aims and objectives. The research aims to find the effect of two ways of urea application, in order to restrict perithecial production by *Venturia inaequalis* in a commercial super intensive apple orchard. The objectives are to reduce scab reserve forms of resistance in winter, and implicitly to reduce primary infection. The urea works in two ways: directly by inhibiting the development of ascospores, and by stimulating the development of antagonistic microorganisms against *V. inaequalis*.

Materials and methods. Experiences were placed at SC Agroindustriala SA, Cluj-Napoca, in the centre of Transylvania, Romania, in 2011, in an apple commercial orchard

with a density of 3200 trees/ha, established in 2004. The biological material was represented by 'Golden Delicious'. The technology was specific to the apple super intensive orchards. The experiment involved the study of influence of spraying treatments with urea in reducing apple scab incidence. The experiment had three variants as followed: V1 - Control – untreated; V2 – sprayed leaves in autumn before falling with 5% urea; V3 - sprayed in autumn with 5% urea, followed by a second (pre-bud-burst) application at 2%. There were made observations on the frequency (F%) and intensity (I%) of apple scab attacks on leaves and fruits, and then attack degree (AD%=F%xI%) was calculated the (Baciu *et al*., 2009). Interpretation of the results was done by analysis of variance (ANOVA test).

Results and Discussion. Data of the Tab. 1 show the results regarding the attack degree of apple scab (*V. inaequalis*) in 'Golden Delicious' apple cultivar after urea application experiment. Both variants, where were used urea treatments, gave differences very significant compared to the control. The lowest attack degree in V3 variant (sprayed in autumn with 5% urea, followed by a second, pre-bud-burst, application at 2%) was registered.

Tab. 1

Attack degree (%) of apple scab (*V. inaequalis*) on 'Golden Delicious' cultivar in the experience regarding effect of urea application (Cluj-Napoca, Romania, 2011)

Variant	Attack degree (AD%)	Relative Attack degree (%)	± d	Significance
V1 - Control (untreated)	81.67	100.00	-	-
V2 - sprayed in autumn with 5% urea	21.33	26.12	-60.33	ooo
V3- sprayed in autumn with 5% urea, followed by a second (pre-bud-burst) application at 2%	11.00	13.47	-70.67	ooo

DL 5% = 3.47; DL 1% = 5.74; DL 0.1% = 10.74

Applications of urea after harvest but before leaf-fall restricted perithecial production by *V. inaequalis.* Immersion of detached leaves in urea appeared to be the most effective method of preventing perithecial formation, although spraying attached leaves was equally effective when leaf abscission occurred within a week of treatment (Burchill, 1968).

In conclusion, urea applications on the leaves, after harvest, proved to be effective to reduce apple scab inoculum. The results illustrated a large reduction in spore production, but to more accurately results, the experiment will be repeated.

REFERENCES

1. Baciu, A.-D, A. Sestras, R. Sestras and M. Buruiana (2009). The Response of Different Genotypes of *Calendula* to *Aphis fabae* Attack. Bulletin of University of Agricultural Sciences and Veterinary Medicine Cluj-Napoca. Horticulture 66(1):498-503.
2. Burchill, R.T., K.E. Hutton, J.E. Crosse and C.M.E. Garrett (1965). Inhibition of the perfect stage of *Venturia inaequalis* (Cooke) Wint. by urea. Nature (Lond.) 205:520-521.
3. Burchill, R.T. (1968). Field and laboratory studies of the effect of urea on ascospore production of *Venturia inaequalis* (Cke.) Wint. Annals of Applied Biology 62(2):297-307.
4. Creemers, P. and S. van Laer (2006). Key strategies for reduction of the dependence on fungicides in integrated fruit production. Phytopathology 39:19-29.
5. Theron, K.I. and W.J. Steyn (2008). Girdling: science behind the age-old technique. Acta Hort. 800:51-60
6. Holb, I.J. (2007). Effect of Four Non-chemical Sanitation Treatments on Leaf Infection by *Venturia inaequalis* in Organic Apple Orchards. Europ. J. Hort. Sci. 72(2):S.60-65.