RESEARCH REGARDING THE ECOLOGICAL HOP (*HUMULUS LUPULUS* L.) CULTIVATION TECHNOLOGY APPLIANCE

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Abstract. In order to obtain agricultural products as "clean" as we can and less polluted with pesticides, a new series of methods for plant protection agains weeds, deseases and mechanical, phisical or biological pests is being tested. In this paper we present some results regarding the reduction of the pesticide utilization in the hop cultivation technology.

For the maintainance of the reduced weeding, without herbicides, we recomand the application of some mechanical tillage of the soil from within the hop rows, hilling and rehilling of the hop rows.

One of the most efficient methods to prevent the sickening of plants is the selection, at the plantation constitution, of the hop varieties that are rezistent or toleranted to the diseases or pests.

For the eccological rebuttal of the hop pests we obtained at USAMV Cluj-Napoca encouraging results with a leaf extract from the French marigolds (*Tagetes patula*) variety.

Hops is cultivated for the female flowerings (cones), content mainly a biological material highly important in brasage, due to its content in bitter acids, volatile oils, resins and so on, but they are also used in the phyto therapy, with a calmant effect, an aphrodisiac and anti bacterial [1, 2]. Hops young sprouts, which didn`t turned green yet, formed in spring of the hops stump, of the chords or of the stolons, are tasty and healthy [3].

As in the case of other crops, and at hops cultivation are preoccupations to the ecologisation of the technology, to reduce pollution and to obtain cleaner and healthier products. In this paper we show the preoccupation of scientists from USAMV Cluj-N. regarding the identification and appliance of several ecological measures of the hops cultivation technology in our country.

Material and method

The research took place during 2006-2007 in hops plantations from Rădeşti Aiud (Alba) and Seleuş Sighişoara (Mureş) at Brewer Gold cultivar (Fig. 1).

Ontrol The min problems of hops maintaince during the vegetation are: weeds control, healthy culture plants control against manna attack (*Peronoplasmopara humuli* Miy.et Tak.) and maintaining undrr the harming level for the green hops lice (*Phorodon humuli* Schrank.) (Fig. 2).

The most frequent weed species in the hops plantations in our country are: *Agropyron repens* L., *Amaranthus retroflexus* L., *Chenopodium album* L., *Convolvulus arvensis* L., *Cirsium arvense* L. şi *Stellaria media* L. [1]. Maintaining the weeds control at a low level without using herbicides can be made by the following mechanical works: sowings or paraplow tillage between rows, bilonage and re biloning on hope rows. These tillage's are made when the weeds are in the first phases of growing (3-4 leaves or 2-5 cm height), and the soil is not wet, for a good quality of soil tillage and weed dry. An important role in reducing weed level is represented by the cutting at "stump ", which are made early in spring,

mechanical or manually, and are represented by putting away the superior part of the hops stump to prevent its increase at the soil level.

To control the invasion with green hops lice was tested and extract from fresh leaves of marigold (*Tagetes patula*). The extract named E3. To obtain it there were crushed 15 kg leaves over which there were added 100 kg combination of propilenglicol and water in report of 1:1. There were left to extract, at dark, for 2 weeks sat the room temperature, then the extract was filtered.

Fig. 1. Hops belonging to Brewers Gold, Rădeşti AB, Aug. 2007

Fig. 2. *Phorodon humuli* attack on hops leaves

Chemical analyse of E3extract

s.u.= 1,4%;
Optical density: DO 280 nm (în dil. 1:10) = 0,850
The content of total phenol : 1500 mg/l (spectophotometrical determined)
The main phenol acids are: cumaric and ferulic acids
The flavonoid compounds: 500 mg/l (spectophotometrical determination)
Compounds with sulfur (tiofenoli)> 0,5 mg / l

All the components of tits extract are **ecological**.

Through this extraction type are extracted the esteric derivates of several volatile oils.

Research results

To maintain in an ecological way, in a healthy way, the hops plantation, it is recommended the cultivars cultivation tolerant to manna. Among these, the Romanian cultivars Napoca 1, Aroma, Productiv, Transilvania and Alfa are better adapted to the pedo climatic conditions specific for the hops culture areas in our country.

The E3 extract appliance was made manually, with a specific pomp, experimental, the same product doses on 10 hops plants.

In the first phase, E3extract was applied on 1st Aug. 2007 in the following doses:

V1 – 50% E3 extract; V2 – 60% E3 extract and V3 – 66,6% E3 extract.

After 10 days, when the effects of the treatment upon the green hops lice was checked, we noticed the following:

V1 –65% percentage control effect.

V2 –35% control effect.

V3 –10% control effect.

The treatment was repeated in another hops plot, too in order to confirm the results, with the following doses:

V4 – 40% E3 extract

V5 – 60% E3 extract.

V6 – 80% E3 extract.

After other 10 days, when the effect was verified we noticed the following:

V4 –70% aphids control effects.

V5 –40% control effect.

V6 – 15% control effect.

There weren't noticed any phyto toxicity or other adverse phenomena on hops plants.

Conclusion

In order to reduce pesticide usage in hops plant protection there will be applied and develop the following physical and agro technical methods:

- Land clearing, during winter period, around hops plantations, columbary shrubs in order to put away the possibility for green hops lice to pass winter time;
- Removing the spiciform sprouts, the main source for manna epidemic, before the appearance of conides, and their burning or burying;
- A correct and in time soil tillage on vegetation phases;
- Destroying the basal sprouts;
- Maintaining a low level of weeds;
- Cultivation of tolerant and resistant cultivars;
- Treatments at stump too, during vegetation with extracts from plants, as the E3 extract from *Tagetes*, in 40% percentage.

Bibliography

1. Duda, M.M., 1998. Contribuţii la elaborarea sistemului de combatere integrată a buruienilor la hamei. Teză de doctorat. USAMV Cluj-Napoca.
2. Muntean L.S., S. Cernea, J. Ghizdavu, V. Florian, I. Mihaiu, M.M. Duda, 2004. Cultura hameiului. Seria-Tehnologii agricole. Ed. Geea Bucureşti, ISBN 973-7982-12-6.
3. Salontai Al., I. Bobeş., T. Perju, 1983. Cultura hameiului, Ed. Ceres, Bucureşti.