

Improvement of seed quality of medicinal plants and herbs in organic farming

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Abstract - As in vegetable growing or grain cropping the seed quality is an important factor for the successful cultivation of medicinal plants and herbs. In spite of intensive efforts made by specialised seed producers there are recurring problems with important quality parameters (e.g. germination capacity, emergence or seed health). The lack of sufficient study results is typical for special purpose crops, also concerning the particular host-parasite relationship and its methodical verification. Few experiences with the improvement of seed quality of medicinal plants and herbs are available. The intention of the study is to test physical and biological methods of seed treatment for their practicability in medicinal plants and herb cultivation. Fundamental information on the pathogens is also examined. Moreover there is a focus on further aspects of the production techniques (e.g. harvesting time) as a means to improve the seed quality.¹

INTRODUCTION

The intention of the study (04/2004 – 12/2006) is to improve the seed quality of medicinal plants and herbs by using strategies with high practical relevance. The focus of the project is set on three sections. On the basis of threshing and clearing adjustment the influence of harvest technique at the development of broken seeds and proportion of geminative seeds is being tested. The effect of the proportion of broken seeds and dehiscent fruits on yield potential is studied and illustrated on coriander. The influence of plant cropping methods on the formation of ingredients, the pathogenic contamination and the germination capacity at the yielded seeds is tested on the cultures fennel, coriander and caraway by using different harvest dates. The main topic of the study is the seed-treatment by physical and biological methods. Hot water treatment, electron treatment and the vacuum-steam-treatment are included. In comparison to the physical methods different biological applications (plant strengtheners, micro-organisms, plant extracts, resistance inducers) are tested. The effect of seed-treatment (con-

sidering germination, emergence and pathogens on the seeds) is mainly studied on Umbelliferae. It is tested in field trials if the primary infection can be reduced by seed treatment.

THERMAL TREATMENT IN WATER

Thermal treatment in water is a well established method for parsley. First positive results on other species have been made in field and laboratory trials. A significant reduction of the infestation of *Mycocentrospora acerina* on annual caraway [*Carum carvi* var. *annum*] was shown with a temperature of 50 °C for 20 minutes (Reduction from 27 % to 0,7 %) One of the main problems in the cultivation of coriander [*Coriandrum sativum*] is the seed-borne bacteriosis *Pseudomonas syringae* pv. *coriandricola*. Very good results with hot water treatment have been achieved with a temperature of 50 °C for 10 minutes. These positive effects were also confirmed in the field trials.

ELECTRON TREATMENT

Seed treatment with low-energy electrons (eventus®) against various seed-borne pathogens was tested in laboratory and field trials. The method has been found very effective against seed-borne pathogens in cereals (*T. caries* and *U. occulta*) (Tigges, Röder and Lidner, 2002). Positive effects of electron seed treatment has been found in a number of comparisons of fennel against *Alternaria radicina* and *Verticillium* spp. (100 % for the adjustment 95 kV/20 kGy) and caraway against *A. radicina* (105 kV/12 kGy, 105 kV/24 kGy and 115 kV/12 kGy). The efficiency degree against *Mycocentrospora acerina* in annual caraway was about 33 %. Higher efficiency degrees were reached against *Pseudomonas syringae* pv. *coriandricola* in coriander (90 %, with the adjustment 95 kV/20 kGy), but they tended to be lower than with hot water treatment.

The treatment of seed coats with electrons has also had positive effects on many pathogens on fennel, for example *Mycosphaerella anethi* (60 %) and *Verticillium dahliae* (100 %).

VACUUM-STEAM-TREATMENT

First positive results with Vacuum-Steam-Treatment (SteamLab) on parsley [*Petroselinum crispum*] and coriander were made. A significant effect of vacuum-steam treatment against *Alternaria radicina* on pars-

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ley was found: reduction of infestation from 65 % (control) to 13 % (treatment 60 °C / 1 min) and to 2 % (70 °C / 0,5 min). No effects against the important seed-borne pathogen *Septoria petroselini* have been noticed so far. A clear reduction was observed against *Pseudomonas syringae* pv. *coriandricola* on coriander seeds. The efficiency degree ranged between 97 % (Parameter 70 °C / 0,5 min) up to 100 % (Parameter 80 °C / 1 min). The germination rate was indeed reduced immensely by the treatment (especially with 80 °C / 1 min). For this new method further optimization is absolutely necessary.

PLANT STRENGTHENERS

The plant strengthener BioZell-2000B (Oil of Thyme) produced a positive effect against the fungus *Mycosphaerella anethi* and *Verticillium dahliae* on fennel seeds. The infestation was reduced by about 40 %. Shown in pot-trials the root-browning of annual caraway (caused by bacteriosis) was reduced after the treatment with BioZell-2000B. There was no indication of a positive effect of seed treatment with plant strengtheners on parsley or dill [*Anethum graveolens*] concerning a better germination rate or emergence. The seed-treatment with the biological application Serenade (micro-organism of *Bacillus subtilis*) reached a higher emergence in laboratory trials on dill in soil infected with *Alternaria radicina*. The coming up of the seedlings was about 46 % in the non-treated control and 66 % in the Serenade-treated seeds.

CONCLUSIONS

The previous studies have been shown positive effects of the tested physical seed-treatment methods of medicinal plants and herbs. The effectiveness of the seed-treatment on some bacterial and fungal seed-borne pathogens could be proved. It is necessary to optimize the parameters of the different seed-treatment methods and to test them on different host-parasite relationships and many species.

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