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Efficacy of kiln drying as phytosanitary treatment against wood borne nematodes

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INTRODUCTION

Kiln drying (KD) often is considered equivalent to a phytosanitary treatment, because it is believed that the reduction of the wood moisture content (MC) will inhibt the growth of harmful organisms and kill them. KD with a wood moisture content reduction to less than 20 % can be achieved using a wide range of process parameters normally defined in a drying schedule. In contrary to a phytosanitary measure the main aim of a KD process is moisture content reduction. Therefore, usually, a minimum drying temperature to be used is not defined – e.g. the EU quarantine legislation only refers to an "appropriate time/temperature schedule" (EU 2000). Therefore the well known lethal temperature (56°C for 30 minutes) is not in all cases reached in kiln drying operations.

Within the EUPHRESCO model project PEKID the influence of low temperature KD treatments on the survival of *Bursaphelenchus xylophilus* and *B. mucronatus* was investigated in comparison to KD treatments which included standard heat treatment conditions as described in ISPM No. 15 (FAO 2013).

MATERIALS AND METHODS

In a first step pre-trials concerning artificial infestion of pine wood with *B. xylophilus* and *B. mucronatus* as well as laboratory KD treatments were conducted. In a second step pilot-scale KD treatments were carried out to investigate the efficacy of KD with respect to phytisanitary aspects. Freshly cut logs (*Pinus sylvestris* mean diameter 29 cm and length 100 cm) were inoculated with *B. mucronatus*. After 59 days incubation time, 4 cm thick boards with a length of 100 cm and widths between 9 and 20 cm were sawn with a mobile band saw. Boards were stacked with 2.5 cm stickers to a final stack of 0.8 m x 1.0 m x 1.0 m (WxHxL). Each drying/phytosanitary treatment was carried out in a small pilot-scale kiln by using the following drying parameters (temperature kiln (T_{air}); equilibrium moisture content (EMC)), to reach the target wood moisture content (MC_{tg}) of 20 %:

1. Low temperature KD treatment: T_{air} = 35 °C and EMC = 13%,
2. KD treatment simulating conditions in a condensation kiln: T_{air} = 35 °C and EMC = 13 % until fibre saturation point (FSP) is reached followed by T_{air} = 50 °C until MC = < 20 %,
3. Low temperature pre-drying plus ISPM 15 treatment: T_{air} = 35 °C and EMC = 13 % until FSP is reached followed by T_{air} = 60 °C until 56 °C core temperature is reached for 30 minutes
4. KD treatment with parameters satisfying ISPM 15 requirments: T_{air} = 35 °C and EMC = 13 % until FSP is reached, T_{air} = 60 °C until MC =< 20 %

RESULTS

1. *B. mucronatus* survives a low temperature KD treatment (MC < 20 %) using a drying temperature of 35 °C.
2. *B. mucronatus* was effectively killed on Probit 9 level with a KD treatment (MC < 20 %) using a treatment temperature of 50 °C.
3. *B. mucronatus* does not survive a KD treatment (MC < 20 %) using a treatment temperature of 60 °C.
4. *B. mucronatus* does not survive an ISPM 15 treatment (56°C core temperature for 30 minutes, without drying the wood) using a treatment temperature of 60 °C.

CONCLUSIONS

A stand alone KD treatment using drying parameters that do not include threshold conditions (e.g. 56°C for 30 minutes throughout the whole wood profile [FAO 2013]), which are lethal to harmful organisms such as *B. xylophilus,* are not suitable to be used as phytosanitary treatment. Import regulations referring to KD therefore need to specify the minimum temperature as well as treatment times to make sure that phytosanitary requirements are met.

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