

Short Communication

EFFECT OF SOLARIZATION FOR ELIMINATING *THEILAVIOPSIS PARADOXA* FROM EXPORT COIR PRODUCTS

M.H.A.D. SUBHASHINI¹ AND A.A.S. YASODARA²

¹ *National Plant Quarantine Service, Katunayake, Sri Lanka*

² *Faculty of Agricultural Sciences, University of Sabaragamuwa, Belihuloya, Sri Lanka*

INTRODUCTION

Coco coir is a proven best alternative to any growing medium widely used. It is a renewable resource that is consistent in quality and 100% environmentally friendly. Coco coir has the best physical and chemical properties to promote better plant growth (Mahmood, 2006). Sri Lanka is the largest brown fibre exporter to the world, annual export is more than 100,000 mt. (Yogarathnam, 2012). However, contamination of coir products with pests, seeds, stones and sands is a big problem face by Sri-Lankan exporters. Contaminations are possible through the production line. The spores (micro- and macroconidia) live freely in the soil and/or in buried sugarcane tissues. The inoculum moves from field to field by means of wind and irrigation or run-off water (CPC, 2007). Pathogen free coir products are important because most of the coir products are used as a substrate in agriculture.

In International trade, it is essential to fulfil the import requirements of the importing country. *Theilaviopsis paradoxa* is one of the common fungi found in the coir products and countries such as Egypt highly concerned about the *T. paradoxa* free consignments (Eman *et al.*, 2011). The sporulation of *T. paradoxa* increases in temperature and attained peak at 28 °C. The population of spores decreased in temperature level beyond 30 °C (Karnataka, 2007). Therefore, temperature can efficiently be used to destroy this fungus. Nowadays, in Sri-Lanka factory men use different sterilization methods such as sun drying, steaming, hot air treatment for coir consignments to make disease free products.

However, export industry is really concerning on profit. To make a profitable industry, low cost methods with high efficacy should be adopted. Therefore, solarization is one of the cheapest and effective methods to fulfil their requirements. This study was carried out to determine the efficacy of different solarization methods to eliminate *T. paradoxa* and to recommend a suitable sterilization method.

MATERIALS AND METHODS

Two experimental units were conducted for coir bulk and coir bricks separately. Pure cultures of *T. paradoxa* were maintained for the experiment. Plastic trays (length 42 cm, width 32 cm and height 8 cm) were used to solarize both bulk and bricks. Trays were washed with clorox solution (250 ml/5 l of water) and rinsed several times with tap water and finally with distilled water. Growing media were sterilized at 1.1 kg/cm² pressure for 15 minutes before use for the experiment. Pathogenic Suspension / spore suspension was prepared from 5 day old cultures of *T. paradoxa*. The culture plate was flooded with 10 ml sterile distilled water and the surface gently agitated with a sterile bent glass rod. Concentration of conidia was determined using a haemocytometer after filtration through layered sterile muslin. 10⁵ spores/ml concentration was used for inoculation. Three kilograms of sterilized coir (bulk) was used in five replicates.

Each tray with coir was inoculated by spraying 5 ml of pathogenic suspension from mother stock mixed with 250 ml of distilled water each. Inoculated samples were covered by polythene bag and plugged with cotton to facilitate ventilation and incubated at room temperature for 5 days. Following treatments were used as follows; T₁ – Coir covered with 300 gauge polythene, T₂ – Coir covered with commercially used micron stretch film (Gauge 80), T₃ – Coir without cover, T₄ - Control (Samples were kept in room temperature). Twenty coir bricks, each with average weight of 650 g were selected. Coir bricks were inoculated by streaking on each side of a brick with 1 loop full of pure culture of *T. paradoxa*. Inoculated samples were covered with polythene bag and plugged with cotton to facilitate ventilation and incubated at room temperature for 5 days. Four treatments were used and same procedure was followed as above.

Both experiments were arranged in Randomized complete block design (RCBD) with 5 replicates per each treatment. Solarization was done 8 hours (8.00 to 16.00 hours) per day for 5 days. Temperature was recorded in each replicate for 5 days. Average values of parameters were taken. Temperature was measured at 15.00 hours since the peak reached at this point. Normal thermometer which was inserted at the depth of 4 cm of a tray and average value was taken from 5 readings of each replicate and finally, average values of 5 replicates under one treatment was calculated as the temperature of that particular treatment of coir bulk. However, for coir bricks 5 readings were taken on the surface of bricks because of the pathogen grow close to the surface (aerobic fungi). Rest of the procedure was same as in coir bulk. Then, average value of 5 replicates was taken under each treatment. Before and after applying treatments random samples were taken from each replicate of both experiments to determine *T. paradoxa* spore counts separately for five days. These Samples were cultured on Potato Dextrose Agar (PDA) medium and spore count was taken using haemocytometer following a standard pathological procedure.

RESULTS AND DISCUSSION

The highest temperature about 48 °C was recorded in the sample that covered with 300 gauge polythene. The 2nd highest temperature was recorded with the sample that covered with stretch film (around 41 °C) while the temperature of uncovered sample was around 35°C. Since the control was kept under laboratory condition it indicated temperature around 29 °C. The above results revealed that there was an increase in temperature with covering. According to this data it was observed that there is a significant different between the control and other treatments. It took three days to complete eradication of pathogen in the samples covered with polythene while four days for samples covered with stretch film. Uncovered samples revealed that gradual reduction of spore count with time. Spore counts of control were not statistically significant within five days.

The highest temperature recorded in the samples that covered with 300 gauge polythene. The Second highest temperature was recorded with the samples

that covered with stretch film while the temperature of uncovered sample was fluctuated between 37 °C to 42 °C. Since the control was kept under laboratory condition it indicated temperature around 29 °C. Figure 2 showed number of spores did not change significantly in the control and gradual reduction of number of spores in uncovered samples. A drastic reduction of number of spore counts on 4th and 5th days in the treatments covered with polythene and stretch film, respectively.

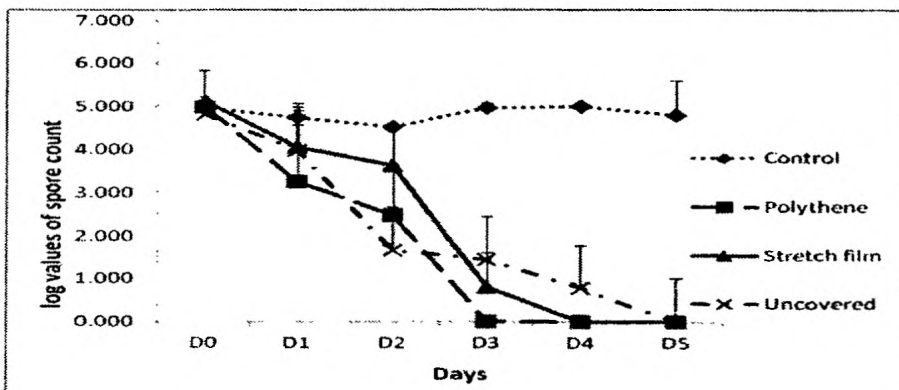


Figure 1: Diurnal changes in spore counts (SC) of solarized coir bulk in each treatment.

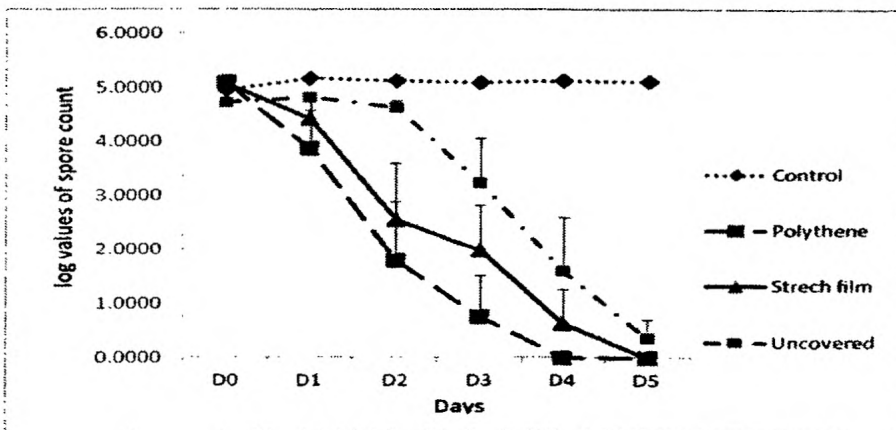


Figure 2: Diurnal changes in spore counts (SC) of solarized coir bricks in each treatment.

Suitable eradication method is in need to have *T. paradoxa* free products. But it has not yet defined. In this experiment it revealed that

solarization as a treatment to increase temperature has completely eradicate population of *T. paradoxa* in coir. Solarization of coir bulk was covered with 300 gauge transparent polythene is more effective in destroying *T. paradoxa* completely within 3 days. Even though the temperature build up was high in coir bricks it took four days to eradicate the fungus. The reason is that heat penetration needs more time in bricks than coir bulk because of the compactness of coir bricks which are formed by compressing coir loose/bulk to 9:1 ratio. Moreover, samples covered with polythene trapped more heat (temperature around 48 °C in bulk, 50-52 °C in bricks,) than samples covered with stretch film (temperature 40 °C-43 °C in bulk, 45 °C-47 °C in bricks). Therefore, polythene can be successfully used as a source to trap heat.

Before preparation of the consignment, sun drying is a normal practice in coir factories to reach the required moisture level (20%). During that period this technique can be easily practiced to get rid of pathogens. Moreover, after preparing consignment, when it is infected, pallets can be solarized. Nowadays, coir producers are advised to practice these treatments without chemicals when contaminations are detected in coir samples after analyzing in the laboratory. Solarization has proved 100% successful results in eradicating *T. paradoxa*.

CONCLUSIONS

Solarization of coir bulk covered with polythene for 3 days continuously completely eradicated *T. paradoxa*. However, coir bricks took 50^o-53^oC, 4 days. Solarization of coir bulk covered with stretch film 40^o-42^oC , 4 days continuously completely eradicated *T. paradoxa*. However, coir bricks took 45^o-47^oC, 5 days. In both cases bricks need higher time and temperature to eradicate the fungus compared to coir bulk.

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