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Effect of Physical Treatments on Seed Germination of *Solanum gilo* Raddi grown in Akwa Ibom State

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ABSTRACT
Heat treatment (dry heat and hot water) are alternative physical techniques for the use of chemicals to reduce seed borne fungi and therefore increase in percentage germination of seed. In this study investigations were made on dry heat and hot water treatment of seeds of Solanum gilo and the resultant effect on percentage seed germination. Seeds that were given dry heat or hot water treatment at 60^{0}C for 20, 40 and 60 minutes had higher percentage seed germination. Both treatments at 60^{0}C for 40 minutes recorded the optimum percentage seed germination (83.26, 81.00 and 79.21, 70.12). Seeds that were given heat treatment of 90^{0}C at 40 and 60 minutes recorded complete inhibition of seed germination. Alternative use of physical techniques is highly recommended, however, treatment should be at temperatures that will not cause damage to seed.
Keywords: *Seed-borne fungi, Heat treatment, eggplant, seed germination*

INTRODUCTION

Solanum gilo Raddi belongs to the family *Solanaceae.* It is a leading vegetable crop in tropical Africa mostly grown in Nigerian, Ghana and Senegal and in South America and the Caribbean countries [5]. It is characteristically ethnobotanical, an important source of food, spice and medicine. They are perennials that are usually cultivated as annuals. The immature fruits are eaten fresh; the leaves are used in some areas as vegetable in cooking. Medicinally, the roots and fruits are used as a carminative and sedative for treatment of burns, cold sores and high blood pressure. Macerated fruits are used as an enema. The roots have compounds with antifungal activity [1, 4].

Despite several uses as food and in medicine their productions have continued to remain a mirage due to some constraints because this plant is susceptible to several diseases [9]. Along with many other factors, seed borne fungi contributes as a major yield reducing agent [3], because about 90% of the farm crop raised on earth soils are propagated by seeds. Quality disease free seeds boost up to 30% successful crop [2].

The work of many researchers has proved that seed disinfection can be done by physical means [8, 10]. According to Munkvold [14] hot water soaks for certain vegetables, flowers and other seeds, if properly done, kill most seed borne fungi and bacteria without killing the seed. McGee [10] concluded that dry heat treatment should be carefully performed to maintain the viability of the seeds. This research was carried out to determine the impact of heat treatment on seed germination of eggplant.

MATERIALS AND METHODS

Dry Heat Treatment

Naturally, infected seeds of *S. gilo* obtained from the market in Uyo and Essien Udim were put in beakers and covered with aluminum foil. Each beaker was separately sterilized put into ovens set at different temperature regimes (30, 60 and 90^{0}C). And each temperature regime was allowed for different periods of time (20, 40 and 60 minutes). At the end of each treatment period, the seeds were removed from the oven and allowed to cool, and then plated on three layers of blotters soaked with sterile distilled water in Petri dishes. All were incubated at 28^{0}C for seven days. The seeds for the control experiment were put in beakers and kept at ambient temperature for the same periods of time. The seeds were then examined for percentage seed germination on blotter.

Hot Water Treatment

Naturally, infected seeds as that for dry heat treatment were used. Seeds were put in small conical flasks and covered with aluminum foil. These were separately submerged in hot-water baths set at different temperature regimes as above for different periods (20, 40 and 60 minutes). At the end of each treatment periods, seeds were withdrawn from hot water bath and allowed to cool and plated on three layers of moistened blotter paper in Petri dishes. The seeds were incubated for seven days at 28^{0}C. They were examined for percentage seed germination on blotter. Seeds for control experiment were put in conical flask and kept at ambient temperature for the various periods of time.

RESULTS

Dry Heat Treatment

Seeds given dry heat treatment at 60^{0}C for 20, 40 and 60 minutes significantly (P<0.05) gave higher percentage seed germination (Fig.2)
when compared with treatment at 30^{0}C and 90^{0}C (Figs.1 and 3). The highest percentage germination was recorded at 60^{0}C for 40 minutes (83.26% and 81.00%).Seed germination reduced significantly (P<0.05) at 90^{0}c for 20 minutes. Seed germination was completely inhibited in seeds treated at 90^{0}C for 40 and 60 minutes.

Hot Water Treatment

Results of the different temperature regime and different time periods on seed germination varied. Percentage seed germination recorded on seeds treated at 30^{0}C at 20, 40 and 60 minutes were not significantly (P<0.05) higher than those of untreated seeds in the two samples(Fig.1) Hot water treated seeds at 60^{0}C for all the time periods gave percentage seed germination that was significantly (P<0.05) higher than the control. The highest percentage seed germination for both samples of 79.21% and 70.12% respectively was recorded by seeds given hot water treatment at 60^{0}C for 40 minutes. Seeds given 90^{0}C treatment at 40 and 60 minutes gave no germination (Fig. 3).

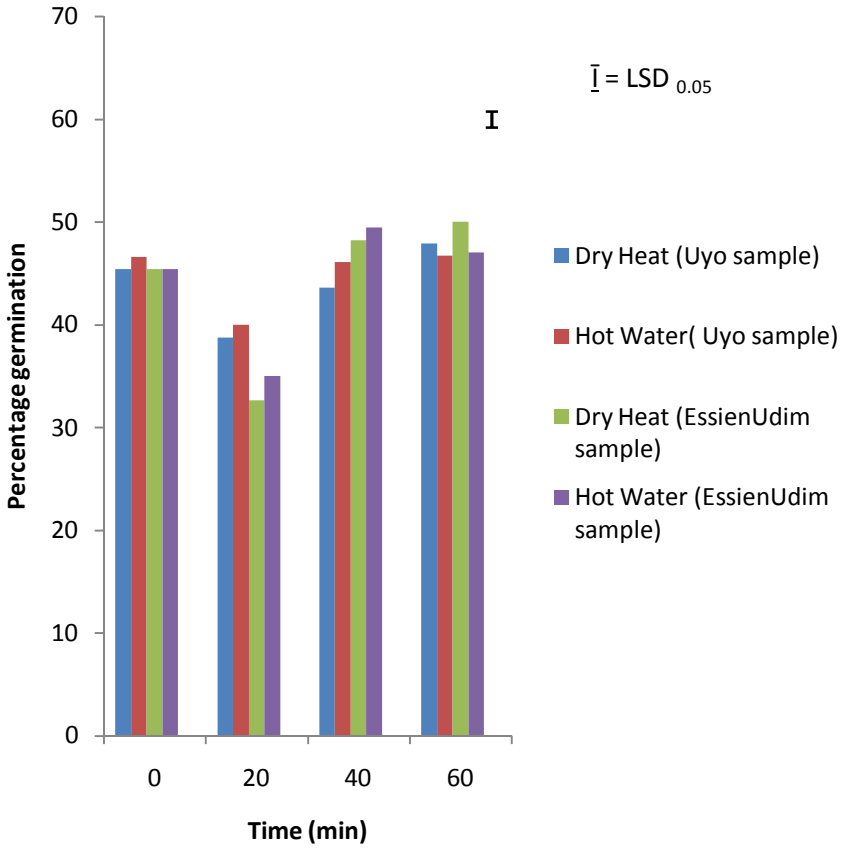

Fig. 1. Effect of heat treatment at 30°C on germination of *S. gilo* seed

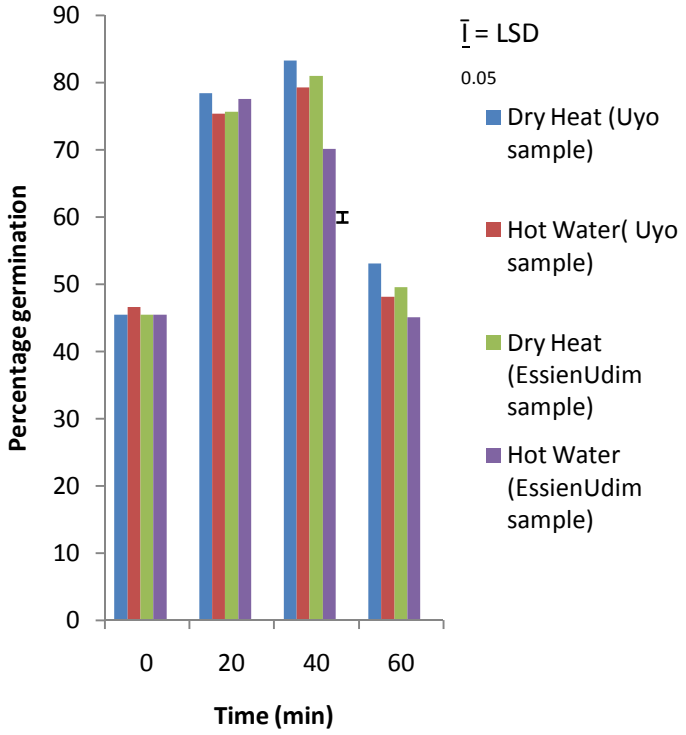

Fig. 2. Effect of Heat treatment at s60°C on germination of *S. gilo* seeds

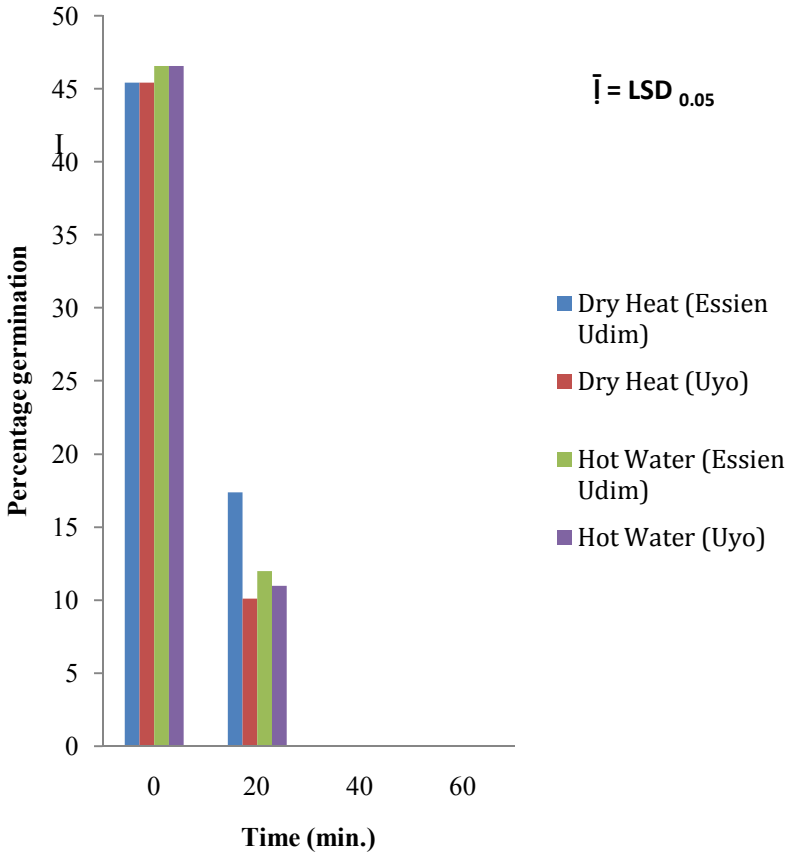

Fig. 3: Effect of Heat treatment at 90°C on germination of *S. gilo* seeds

DISCUSSION

The results of this investigation revealed that percentage seed germination depends on the temperature regime, time lag of treatment as well as the type of seed borne fungi to be controlled . Temperature of 60^0C and 90^0C in all the periods of treatment significantly ($P<0.05$) reduced incidence of all the seed borne fungi. At 90^0C for 40 and 60 minutes, treatments gave no seed germination at all in both dry heat and hot water when compared with control.

Treatment at higher temperature (90^0C) regime, completely reduced seed viability. This might be because of high temperature which killed the embryo of seeds. This agrees with the findings of Nwachukwu [5], that temperature of 70^0C and above in all the period of treatment reduced significantly ($P<0.05$) the seed germination of African yam beans. The findings of Couture and Sutton [7] also shows that dry heat treatment of barely seeds at 90^0C for 60 hours eliminated *Drechslera sorokiniana* and reduced seed survival. Stoll [12] reported that heat treatment of cowpea at 65^0C for 5 minutes did not significantly alter germination percentage. Dumeroese *et al.* [11] in their study reported that hot water treatment of Douglas fir seeds at 55^0C for 90 seconds almost eliminated *Fusaruim spp* and did not significantly reduce germination, but longer times killed seeds. Naumann and Karl [13] reported that exposure to dry heat (50^0C) for 72 hours or 60^0C for 24 hours gave greater than 99% disinfection of artificially contaminated bean seeds without germination rates.

These results show that heat treatment of *S. gilo* seeds at temperature of 90^0C for 20, 40 and 60 minutes will eliminate seed borne fungi but will affect seed viability. Seed of *S. gilo* should be given dry heat or hot water treatment at 30^oC for 60 minutes and 60^oC for 20, 40 and 60 minutes because this treatment reduces seed borne fungi significantly ($P<0.05$) and enhance optimum seed germination.

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