

## Germination Studies and Early Seedling Growth of Some Local Spices Found in Niger Delta Nigeria.



### Education

**KEYWORDS :** Germination, Seedling growth, spices, pretreatment

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### ABSTRACT

*Spices are aromatic parts of plants used for thousands of centuries by many cultures to enhance the flavour and aroma of foods. Early cultures also recognized the value of using spices in preserving foods and for their medicinal value. The present study investigates the germination and early seedling growth of some local spices found in Niger Delta region of Nigeria. Species studied were *Xylopiya aethiopic*, *Piper guineense*, *Aframomum sceptrum*, *Aframomum danielli*, *Capsicum frutescens*, *Capsicum annum* and *Capsicum cayenensis*. In an attempt to promote germination, some pre-sowing treatments were employed. Seeds were germinated in the incubator and in the green house. Maximum germination response (100%) was recorded for *Capsicum annum*. Results also showed that germination were observed in seeds of *Capsicum* species pretreated with conc. H<sub>2</sub>SO<sub>4</sub> soaked for 2 minutes. Hence, sulphuric acid soaked for 2 minutes can be used to remove dormancy and enhance germination percentage and seedlings growth performances in *Capsicum* species.*

### INTRODUCTION

Spices have been used for thousands of centuries by many cultures to enhance the flavour and aroma of foods. Early cultures also recognized the value of using spices in preserving foods and for their medicinal value. Effects of the presence of spices can be seen in food products such as pickles, bread, rice and meat products (Shelef, 1983).

Iwu (1993) had reported that spices owe these properties to the presence of various types of essential oils. Aziezek (1989) reported that the rich presence of essential oils and Oleoresins determines the aromatic flavouring, colouring and pungent properties on spices and condiments.

In Niger Delta of Region of Nigeria, these spices and their herbs are used generally to prepare "pepper soup" which are either taken hot or cold especially during cold weather. Achinewuet *al* (1995) reported that these spices are particularly very important in the diet of post partum women as an aid to the contraction of the uterus.

Most recently, due to the increased interest and commercialization of botanicals for their health related effects, many spices are being evaluated for potential health benefits. Historically, many spices were used for various preventive and fixative properties.

Since several spices do exhibit among antioxidant activity, it only makes sense that they are increasingly studied for health benefits. Natural antioxidants are known for their capacity to protect cells from damage induced by oxidative stress generally considered as a course of aging, degenerative disease and cancer.

In cultivation, the seeds of these spices are classified under seeds with hard endosperm. This is a condition of hard seededness otherwise known as seed coat impermeability which has to do with the inability of a seed to take in water and other valuable constituents that abates growth due to a hardened seed coat. This condition thus makes the propagation of spices a little complicated because a lot of treatments have to be applied to the seed to enhance its germination. In the present study, seven different types of spices namely *Xylopiya aethiopic*, *Piperguineensis*, *Aframomum sceptrum*, *Aframomum danielli*, *Capsicum frutescens*, *Capsicum annum* and *Capsicum cayenensis*.

Little work has been done on seed germination and seedling growth of these spices. This work is therefore aimed at determining the most effective methods employed in breaking certain

growth inhibitors of these spices.

### MATERIALS AND METHODS

#### Seed Collection and Pretreatments

The seeds of the seven different samples were collected from local cultivars at different locations in Uyo, Akwa Ibom State. Presowing treatments were done in order to improve the quality of germination. Untreated seeds were used as control, seeds were soaked in water for 24 hours in darkness, hard coated seeds were steeped in conc. sulphuric acid for 2 to 10 minutes and scarified seeds were washed with distilled water thoroughly before sowing. Some scarified seeds were later nicked 3 days later to ease water penetration to the embryo.

Germination of treated and control seeds were done in darkness under laboratory conditions. Twenty (20) seeds of each species were used. The seeds were placed in petridished on Whatman No1 filter paper, moistened with water. The set up was incubated at 28°C under total darkness. Radicle profusion through the seed coat was the criterion for germination. Germination was evaluated in the room under diurnal illumination. In the green house, seeds were placed in shallow rubber containers filled with garden soil. The containers were perforated at the bottom. The range of values of natural radiation and temperatures were 520 – 750 lux and 26 – 30°C. Seeds used in the green house were all untreated and were sown directly. Hypocotyl elongation was the criterion for germination and reading were recorded daily for a period of 3 weeks.

#### Germination Studies and Seedling Development

Germination studies carried out on the species both in the laboratory and in green house were records of daily germination, until non-viable seeds rooted, determination of germination rates for each treatment and determination of maximum percentage germination. The seedling development parameters assessed were leaf area, leaf length and stem length (Ting, 1982).

### RESULTS AND DISCUSSION

The percentage germination obtained were fast in the three species of pepper both in the green house and dark (incubator). The results obtained showed that seeds soaked in conc. Sulphuric acid for 2 minutes and soaking seed in water for 24 hours increased germination rate than other pretreatments methods and the maximum germination i.e. 100% was recorded for *Capsicum annum* in green house (Figure1). However, *Xylopiya aethiopic*, *Aframomum spp* i.e. *danielli* and *septrum* and *Piper guineense* showed no germination in the dark suggesting the presence of

a strong dormancy mechanism. Germination also failed under shade (green house) even though temperature changes there would have stimulated germination (Sauza, 1996).

Different approaches of breaking seed dormancy, in order to enhance germination rate and to increase germination rate and to increase germination process were argued by many authors (Yadav, 1992; Alamgir and Hossain, 2005a, b; Airiet *al.*, 2009; Azad *et al.*, 2010a, b). Among the methods used in breaking seed dormancy include physical scarification of seed coat by nicking; filling with needles, knife and or abrasion paper (Schmidt, 2000). In addition, methods such as acid treatment (Kobmoo and Hellum, 1984; Pipiniset *al.*, 2011) or hot water treatment (Schmidt, 2000) can be used to overcome physical seed dormancy. Hossain *et al.*, (2005) reported that seeds with hard, solid, impermeable seed coat were noted to establish germination after pre-sowing treatments. However, breaking of seed varies from species to species. Therefore, it is very important to determine which method and condition is suitable for each plant species.

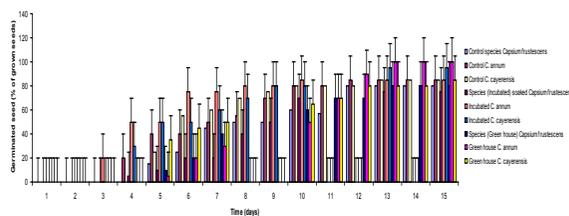
Several treatment were employed in the laboratory to trigger germination but these were unsuccessful in promoting germination in *Xylopia aethiopica*, *A. sceptrum*, *A. danielli* and *Piper guineense* except for *Capiscium frutescens*, *C. annum* and *C. cayenensis* which showed varying degree of germination after treatments were employed. However, sulphuric acid soaked for 2 minutes enhanced germination rate in the three species of *Capiscium* (Figure.2).

The considerable germination percentage with concentrated sulphuric acid scarification occurred as a result of the ability of the acid to degrade the seed coat of *Capiscium* spp. Thereby reactivating the physiological and biochemical activities needed for seed germination. This result was in agreement with the report of Mohammad and Musa (2003) on the superiority of sulphuric treatment compared with other tested treatments on germination of tamarind seeds. Similarly, Pipiniset al (2011) noted sulphuric acid treatment proved more effective than nitric acid and alcohol in breaking dormancy. Consequently, Ren and Tao (2004) reported that conc. Sulphuric acid treatment recorded superior germination rate in *Calligonum* species compared to cold scarification treatment. The effect of H<sub>2</sub>SO<sub>4</sub> on promotion of seed germination might be due to the highly decedent effect of the acid on the seed coat thereby allowing easier water uptake and oxygen diffusion. The non response of *Xylopia aethiopica*, *A. Sceptrum*, *A. danielli* and *Piper guineense* to treatments may have suggested these seeds were in the state of true dormancy and needs storage at low temperature. Species of pepper germinated well in the dark at room temperature, growth of the young seedling was promoted when exposed to light but later deteriorated quickly when kept in dark again. Seedlings growth parameters of *Capiscium* species were also influenced by different pre-treatment test (Figure 3).

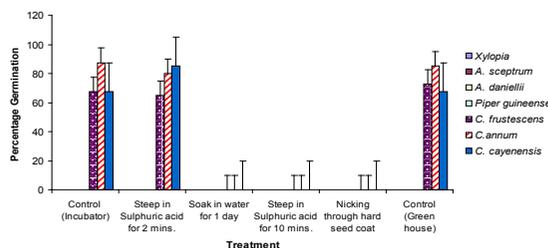
Seedling growth is a crucial importance to successful plant establishment after germination. Constant light and water supply promote healthy and high seedling survival. Low seedling growth in the green house may have been the result of shading effects.

**CONCLUSION**

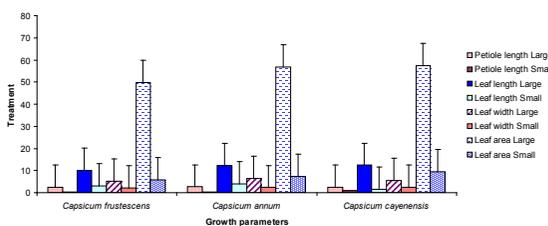
Our results revealed that conc. H<sub>2</sub>SO<sub>4</sub> soaked for 2 minutes can remove dormancy and enhance germinate rate and growth performances in *Capiscium* species.



**Figure1: Percentage germination**



**Figure2: Effect of different treatment on rate of Germination**



**Figure3: Effect of treatment on seedling Growth parameters**

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