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Sodium Chloride Priming Enhances Germination of Stinging Nettle (*Urtica dioca* L.) Seeds

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***Abstract*— Stingingnettle is a useful plant with food and medicinal uses.The green leaves are either cookedand eaten as vegetable or dried and ground in to powder before consumption. It contains high levels of vitamins and minerals providing good nutrition at low costs compare to exotic vegetables. Consequently,there has been increased consumption of stingingnettle in Kenya but large-scale production is limited by lack of reliable planting materials since stingingnettle seeds which are mostly dormant. The objective of this research was to perform pre-germination tests on stingingnettle seeds and determinethe most effective method to breakseed dormancy.**

200 seeds were soaked in 1%sodium salt for 2 and 5days at 150C while another set of 200 seeds were soaked in 18 Msulphuric acid for 10 and 30 minutes and placed in the germination chamber.

Seeds soaked in distilled water were used as controls. Germination tests were conducted on moistened filter paper in petridishes of 50 seeds each with three replications. Radicle protrusion was observed daily and germination rate assessed as mean days to germination.

Germination rates differed significantly with the time of treatment. Seeds primed with 1% Nacl for 5 days yielded maximum germination rate followed by scarification using 18 MH2SO4 for 30 minutes and no germination was observed in seeds soaked in distilled water at room temperature. Our study indicates that priming seeds with 1% sodium salt solution at 15ºC for 5 days is aviable method for breaking seed dormancy and enhancing uniformity and speed of seed germination.

***Index Terms*— Dormancy, Halo priming, Hydro priming,Scarification.**

I. INTRODUCTION

Stinging nettle (*Urticadioica*L.) is a herbaceous perennial plant in family Urticaceae which consists of about 48 genera and 1050 species of plants. The plant mainly spreads through rhizomes that multiplies underground resulting multiple shoots that may grow up to 3M in height. Shoots and stems are covered with 2mm long stinging hairs which release pain-inducing toxins [11] and hence the name. Leaves are large, opposite, heart-shaped with serrated margin and when mature, the plant produces tiny numerous green flowers that have no petals and hang in drooping clusters. The plant produces about 10,000-20,000 seeds that are elliptic in appearance [5].

Traditionally, stinging nettle has been used as a vegetable as well as a medicinal herb [7],[1]. Leaves and seeds maybe cooked and eaten or dried and ground into powder for use as an infusion in hot water [15]. It contains relatively high levels of crude protein, fiber and carbohydrate [1] as well as significant number of biologically active compounds such carotenoids, terpernoids and polyphenolic compounds [11]. Leaves contain high-quality source of amino acids, vitamin A, and vitamin C [15]. The plant has also received global attention due to its pharmaceutical merit which include analgesic, antimicrobial, antibacterial, antidiabetic, cardiovascular, diuretic and ant-inflammatory effects [5]. Stinging nettle thus is an inexpensive high-quality nutrition source suitable for both rural and urban populations.

Like many African leafy vegetables (ALVs), stinging nettle is a weedy, semi-cultivated species that require little management and inputs. In addition, the plant can grow quickly and reach harvest stage within a short period making it useful in sustaining nutrition intervention programmes. Despite the nutritional benefits and increasing demand for the vegetable, little agronomic research has been conducted particularly in regard to propagation which is delimited by seed dormancy resulting to poor germination and growth of plants. Although chemical inhibitors, hard seed coat and darkness have been reported as major factors causing dormancy [9],[3] treatments and technologies for breaking seed dormancy in stinging nettle remains under-reported.

The current study therefore aims at providing insight on necessary pre-sowing treatments for stinging nettle seeds for ease of propagation in large-scale production.

II. MATERIALS AND METHODS

Mature stinging nettle seeds were collected from wild growing plants in Kiambu County, Kenya and separated into two lots of 200 seeds each. Treatments included two levels of halo priming with sodium chloride (NaCl), two levels of scarification with sulphuric acid (H_2SO_4) and two levels of hydropriming with distilled water.

In halo priming, 200 stinging nettle seeds were soaked in 1% NaCl solution, placed in darkness at 15°C for 2 days and 5 days. For scarification, 200 nettle seeds were soaked in 8M H_2SO_4 for 10 minutes and 30 minutes. Hydro priming treatment was used as control where two seed lots were soaked in distilled water and placed in darkness but one lot at 15°C and another at ambient laboratory conditions (25-29°C). Aluminium foil was used to cover the seeds to minimize evaporation of the soaking solution. Seeds were then rinsed thoroughly in running tap water for 5 minutes.

Germination tests were conducted on moistened filter paper in 90mm petri dishes each having 50 seeds with three replications and incubated in a germination chamber in the dark at 15°C and room temperature. Radicle protrusion was assessed daily and germination rate determined. The

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experiment was conducted twice.

Percentage germination data were arcsine transformed prior to ANOVA. The means were separated on the basis of least significant differences (LSD) at the 0.05 probability level.

III. RESULTS AND DISCUSSION

According variance analysis, pre-soaking seeds with 1% NaCl for 5 days had significant ($P<0.01$) effect on germination rate. 50% of the seeds geminated within seven (7) days and cumulatively, the highest germination rate of 95% was achieved after 17 days in seeds pre-treated with 1% NaCl for 5 days. This was followed by seeds scarified with 18M H_2SO_4 for 30 minutes and 1% NaCl for 2 days (79% and 77%, respectively). There was no germination of seeds in distilled water at room temperature showing that low temperature is required to stimulate germination of stinging nettle seeds.

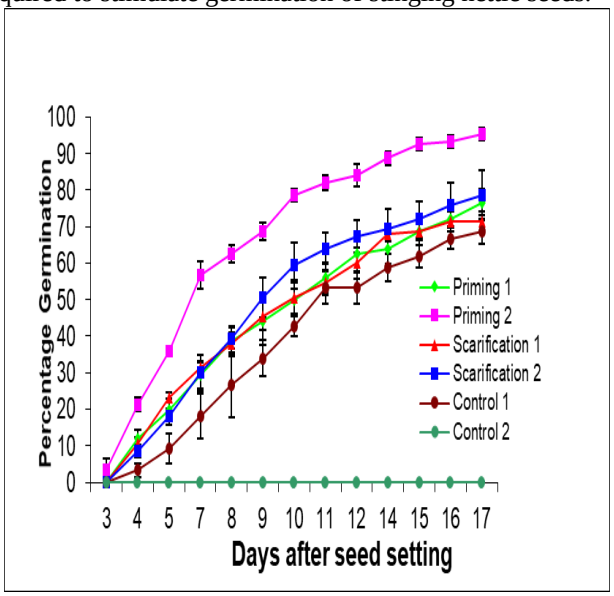

Fig 1. Germination percentage of stinging nettle seeds in 24hr dark regime at 15˚C (except control 2). Error bars are ± S.E (n=3 Petri dishes with 50 seeds each). Priming 1 &2 is soaking in 1% Nacl for 2 and 5 days respectively, Scarification 1 & 2 is soaking in 18M H_2SO_4 for 10 and 30 minutes respectively, Control 1 & 2 is soaking in distilled water at 15˚C and ambient temperature respectively.

Seed priming is a commercial technique for enhances rapid and uniform seed germination. It involves water absorption by seed followed by drying to trigger germination processes [13]. Hydro-priming, halo-priming and hormonal priming are effective in breaking seed dormancy of various wild and domesticated plants [10]. Different crops respond differently to various priming techniques For instance, several authors have reported that sodium chloride reduces seed germination [14],[12],[6] but the current study shows that germination of stinging nettle seeds is stimulated by 1% NaCl for an extended period of 5 days. Halo priming with KNO3 3% for 6 days at 20°C was shown to reduce seed emergence time of water melon seed and increased the growth rate [13]. [8]reported that priming success depends on the duration of treatment, temperature and water potential of the priming solution.

Seeds of many wild plants may be dormant because of presence of hard seed coats which may inhibit water absorption and hence suppressed oxygen levels. Mechanical or chemical scarification of the seed coat can increase seed permeability [5]. Scarification overcomes dormancy by abrading the outer layer of the testa but this involves the risk of damage to the embryo within [16]. In the current study, 79% of seeds germinated after chemical scarification using 18M H_2SO_4 for 30 minutes. This could imply that presence of hard seed coat is also responsible for dormancy in stinging nettle seeds. However, [5]ruled out presence of hard coat in nettle seeds after observing a decline in germination rate of seeds treated with H_2SO_4. The different results could beexplained by differences in molarity of the sulphuric acid used and climatic conditions which has significant impact on plant structural adaptations.Light has a regulatory effect on germination of many wild plants [2]. No germination was reported for seeds stored in the dark at room temperature

In the current study indicating that light is a requirement for nettle seed germination and this observation is in tandem with [5] who reported the highest germination at room temperature but in the presence of light.

It is evident that high quality seeds form the bases for a good crop stand and high yield. In conclusion therefore, priming them with 1% sodium salt solution at 15ºC for 5 days increases uniformity and speed of germination of stinging nettle seeds. The technique of halo priming is considered low cost and hence feasible in large scale production

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