Influence of Moringa Leaf Extract and Coconut Water as Priming Agent to Improve the Emergence and Early Seedling Growth in Cucumber

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ABSTRACT

Rapid and uniform field emergences are two essential prerequisites to increased yield, quality, and ultimately profits in annual crops production. Priming with plant growth regulators have been widely reported to improve seedling vigor and emergence. This study was conducted to evaluate the possibility of improvement in emergence and early seedling growth in cucumber by treating the seeds of cucumber for 18 hours in aerated solution of Fresh moringa leaf extract; FMLE, Stored moringa leaf extract; SMLE and Fresh coconut water; FCW. Priming with plant growth regulator improved the emergence rate and uniformity and early seedling growth. However, seed treatment with FMLE was more effective in reducing the mean emergence time, and improving the final emergence percentage and emergence energy and number of roots. However, maximum seedling fresh and dry weights, root length were recorded from seed treatment with fresh coconut water. Seed treatment with moringa leaf extract and/or coconut water can be successfully employed to improve the germination and seedling growth in cucumbers.

Key Words: Cucumber; Moringa leaf extract; Coconut water; Seed priming.

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INTRODUCTION

Uniform emergence and rapid growth are very important prerequisites to increased yield, quality, and ultimately profits in annual crops production. Uniformity and percentage of seedling emergence of direct-seed crops have a major impact on the final yield and quality (Wurr and Fellow, 1983). Rate and uniformity of emergence are inherent to seed quality and environmental conditions during seedling emergence. Slow emergence results in smaller plants (Parera and Cantiliffe, 1994) and seedlings.

Seed priming is commonly used to reduce the time between seed sowing and seedling emergence (Parera and Cantliffe, 1994). Evenari (1980) reported that ancient Geek farmers soaked the seed of cucumber in water or milk and honey before sowing to increase germination rate and emergence. Nelsona and Govers, (1986) reported delayed and reduced seedling emergence is major setback to achieve uniform and vigorous crop stand in early spring planted cucumber (*Cucumissativus*L.). Moreover, erratic and non-uniform seedling emergence due to poor seed germination causes non-uniform plant development, thereby extending cucurbit fruit maturation for early markets.

Application of plant growth regulators or nutrients during pre-soaking, priming and other pre-sowing treatments in many crops have improved seed performance that results in overall plant growth and productivity particularly under adverse conditions, such as temperature extremes or salinity (Afzal *et al.,* 2008).Among the different natural sources used, extracts of plants and their endogenous growth regulators e.g., *Moringa oleifera* L. and Coconut water are gaining a lot of attraction (Foidl *et al.,* 2001).

Moringa belongs to family Moringaceae. There are about 13 species of moringa of which *M. oleifera*is most widely grown. The leaves of moringa are rich in zeatin. Itcan be used as natural source of cytokinin (Fuglie, 1999). In addition, moringa leaf is also rich in ascorbates, carotenoids, phenols,

potassium and calcium, which have plant growth promoting capabilities and often applied as exogenous plant growth enhancers (Foidl *et al.,* 2001). Antioxidants such as ascorbic acid and glutathione, which are found at high concentrations in moringa chloroplasts and other cellular compartments, are crucial for plant defense against oxidative stress (Noctor and Foyer, 1998).

The coconut (*Cocos nucifera* L.) is an important fruit tree in the tropical regions and the fruit can be made into a variety of foods and beverages. The edible part of the coconut fruit (coconut meat and coconut water) is the endosperm tissue. Coconut water (coconut liquid endosperm), with its many applications, is one of the world's most versatile natural product which is consumed worldwide as it is nutritious and beneficial for health. (Jean *et al* 2009). Some of the most significant and useful components in coconut water are cytokinins, (e.g., kinetin and *trans*-zeatin) which are a class of phytohormones (Kende and Zeevaart, 1997.), indole-3-acetic acid (IAA), the primary auxin in plants (Wu and BU, 2009), and other components like sugars, sugar alcohols, lipids, amino acids, nitrogenous compounds, organic acids and enzymes (Santoso *et al*,1996.), and they play different functional roles in plant and human systems due to their distinct chemical properties.

In view of all these reports, it is hypothesized that priming with leaf extract from moringa and coconut water, having a number of plant growth promoters,mineral nutrients and vitamins in a naturally balancedcomposition, may promote the plant growth and vigor. Therefore, the aim of this study is to evaluate the influence of pre-sowing Moringa leaf extract and Coconut water seed treatments on germination and early seedling growth of cucumbers.

MATERIALS AND METHODS

Seed materials: Seed of cucumber, cv. Nabil, were obtained from Premier Seed Nigeria limited. Zaria Kaduna State. Fresh moringa leaves were collected from a mature moringa tree and juice was extracted by a

locally fabricated juice extraction machine following the method of Foidl *et al.* (2001), while fresh coconut was harvested from the mature tree and the water was extracted. Seeds were primed with fresh coconut water, fresh and one month stored moringa leaf extract (MLE) for 18 h. Seeds were primed with respective aerated solutions of FMLE, FCW, SMLE 18 h. Non-primed seeds were considered as controls. Continuous aeration was provided using small aquarium pump. After each soaking treatment, seeds were dried on filter sheets for 48 hours at room temperature.

Evaluation of vigor: Control and primed seeds were sown in 20×20 cm plastic trays (25 in each) containing moist acid/water washed sand, replicated three times in a growth chamber arranged in a completely randomized design. Numbers of emerged seedlings were recorded daily according to the seedling evaluation of the Association of Official Seed Analysts (1991) until a constant count was achieved. Mean emergence time (MET) was calculated according to the equation of Ellis and Roberts (1981). Energy of emergence (EE) was recorded on the fourth day after sowing. The percentage of emerging seeds 4 days after sowing was determined relative to the total number of seeds tested (Farooq *et al.,* 2006). On the fifteenth day after emergence, seedlings were tested for vigor after being carefully removed from the sand. Number of roots, shoot and root length of five randomly selected seedlings were recorded per replicate and average seedling fresh weight was determined. Immediately after harvest; dry weight was taken after drying at 70°C for 7days.Graphical representation of data was made using Microsoft Excel program (Microsoft Corporation, Los Angeles, CA, USA). Standard error was computed using Microsoft Excel programme for comparison of treatment sand parallels were drawn between emergence and seedling growth.

RESULTS

All the priming treatments were effective in reducing the mean emergence time (MET), while enhancing final emergence percentage (FEP)

and emergence energy (EE) as compared to that of unprimed seeds which had low seed vigor and poor seed performance; (Fig. 1 and 2). It was noted in this study that seed priming resulted in improved seedling growth as indicated by increased root and shoot length, seedling fresh and dry weight (Fig. 3and b; 4a and b;).

Seed priming can enhance the germination and early seedling growth in cucumber. Priming of cucumber seed with plant growth regulator decreased the emergence time and increased seedling emergence and seedling fresh and dry weight. Seed Priming not only resulted in earlier and more uniform emergence and emergence percentage, energy of emergence was also improved.

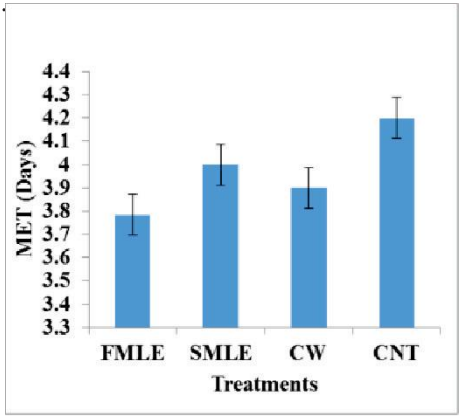
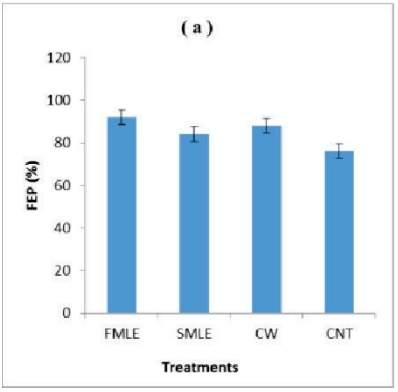
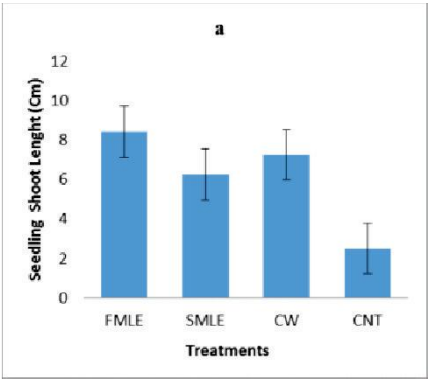


Fig.1: Influence of seed Priming on Mean Emergence Time ± s.e. in Cucumber





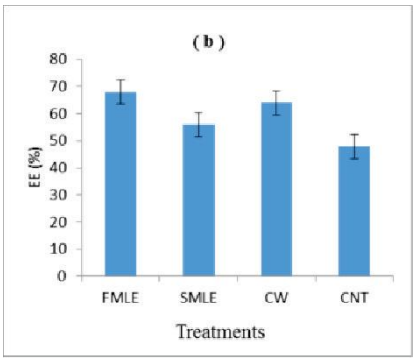


Fig.2: Influence of Seed Priming on (a) Final Emergence Percentage and (b) Emergence Energy (EE) ± s.e. in cucumber

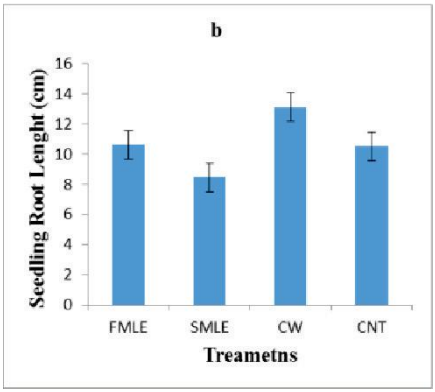


Fig.3: Influence of seed Priming on (a) shoot length and (b) root length ± s.e. in Cucumber

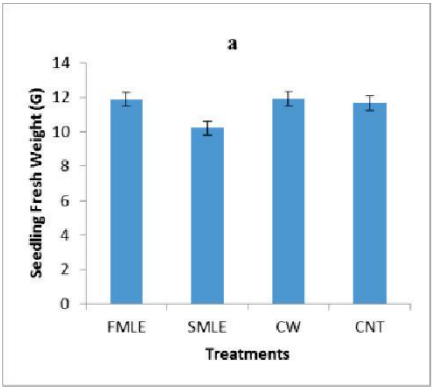
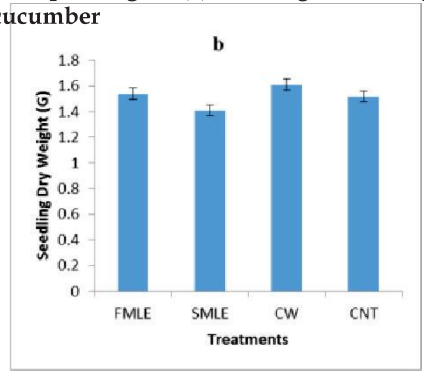


Fig.4: Influence of seed priming on (a) seedling fresh weight and (b) seedling dry weight ± s.e. in cucumber



DISCUSSION

The present study shows that hormonal priming with plant growth regulators can be employed to improve early emergence and seedling growth in cucumber. Emergence rate, root shoot lengths, seedling biomass are all important contributors of seed vigor. Higher emergence rate is the main foundation, which ensures an improvement of overall seedling performance. The results of present study indicated that seed priming with FMLE resulted in earlier emergence, reduced MET and improved the final emergence and emergence energy as compared to FCW and SMLE (Fig. 1 and 2). Increase in germination percentage after treatment might be the consequence of higher nutrients and vitamins of FMLE and/or high content of zeatin a natural cytokining found in the leaf of moringa. Seedling vigor was also improved by treating cucumber seeds with plant growth regulator, it was noted that seed priming with fresh coconut water has the highest seedling fresh and dry weights (Fig. 4a & 4b) which might be due to increased cell division within the apical meristem of seedling roots (Fig. 3b) from the phytohormones found in the coconut water (Kende and Zeevaart, 1997), while FMLE improved the seedling shoot length.

Hence, seed priming with Plant growth regulator (FMLE and FCW) can be successfully employed to improve the germination and seedling growth in cucumbers.

In conclusion, fresh moringa leaf extract and coconut water is effective for improving germination and early seedling growth and needs further investigation for its role in cucumber flowing and yield under various temperature.

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