PRELIMINARY STUDY ON EMERGENCE OF NINE INTRODUCED TEMPERATE FORAGE GERMPLASMS IN SHIKA, NIGERIA

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ABSTRACT

A trial was conducted with nine imported temperate forage germplasms at the National Animal Production Research Institute, Shika, Nigeria. The seeds consisted of seven grasses namely; Beefsteak plant (*Fructus perillae*), Sweet elephant grass (*Pennisetum alopecuroides*), Wild foxtail millet (*Setaria viridis*), Napier grass (*Pennisetum purpureum*), King grass (*Pennisetum sinese*), Chinese sorghum (*Sweet sorghum*), Zea mexican schard (*Purus frumentum*) and two legumes namely; Chinese woad (*Isatis tinctoria*) and Chinese alfalfa (*Medicago sativa*). A laboratory germination test and pot emergence trials were carried out to ascertain seed viability. The result of the experiment showed that Sweet elephant grass, Napier grass and King grass recorded over 90 % germination and the least was 30 % in Chinese Sorghum. Chinese alfalfa and wild foxtail millet did not germinate with 100 % Seed dormancy. Highest emergence rate, seedling length and seedling vigour index were observed in King grass than the other forage germplasms. The highest percentage emergence was obtained in King grass > Sweet elephant grass > Napier grass > Zea Mexican schard > Beefsteak plant > Chinese woad > Chinese sorghum respectively. The forages except Chinese alfalfa and foxtail millet can successfully be adopted as animal feed resources in Nigeria and therefore, recommended for multi-locational trial in all the ecological zones in the country.

Keywords: Emergence, Temperate, Forages and Germplasms

INTRODUCTION

Most tropical countries of the world and Nigeria in particular are faced with constrain of lack of livestock feeds in both quantity and quality especially during the periods of long term dry season and drought. The quest to increase diversification and sustainable livestock production under rangelands and sown pastures have led to the importation of nine temperate forage germplasms from China in year 2016 to the National Animal production Research Institute, Shika, Kaduna state, Nigeria. The seeds were tested in the Forage laboratory to determine their germination ability and adaptation to the new environment Omokanye *et al.* (2000). The emergence study will provide a prior information for further research on growth and nutritional quality of the temperate seeds introduced to Nigeria. The germination percentage is an estimate of viability of a population of seeds (CFIA, 2013). The objective of this study is to test for germination ability and emergence potential of the seeds.

MATERIALS AND METHODS

Germination and emergence trial were conducted at the Forage laboratory of Feeds and Nutrition Research Programme, National Animal Production Research Institute, Shika. Shika, is located on latitude 11^0 12' N. longitude 07^0 33' E and altitude 660m above sea level in the Northern Guinea Savannah of Nigeria. Wet season starts from April to early May and ends in late September to early October. Long-term annual rainfall ranges from 1110- 1580mm with a maximum temperature of 30^{0}C and relative humidity of approximately 70%.

Germination test

The nine temperate forage seeds includes: 7 grasses namely; Beefsteak plant (*Fructus perillae*), Sweet elephant grass (*Pennisetum alopecuroides*), Wild foxtail millet (*Setaria viridis*), Napier grass (*Pennisetum purpureum*),

King grass (*Pennisetum sinese*), Chinese sorghum (*Sweet sorghum*), Zea mexican schard (*Purus frumentum*) and 2 legumes namely; Chinese woad (*Isatis tinctoria*) and Chinese alfalfa (*Medicago sativa*). Thirty (30) seeds from each germplasm was counted in and placed in petri dishes covered with transparent lid and lined with two layers of Whiteman filter paper. Water was added to the filter paper to provide moist environment. The seeds were arranged in a Completely Randomized Design with three replicates totalling 90 seeds per species. Watering and germination counts began 24 hours after the commencement of the experiment according to the procedure of Babayemi *et al.* (2003). Germination percentage was computed using the following formula:

$$\text{Germination percentage} = \frac{\text{Total seed germinated}}{\text{Total seed sown}} \times 100$$

Seedling emergence

A pot experiment was carried out for seedling emergence of all the temperate seed germplasms in 17cm x 13cm x 6 cm plastic containers. The containers were filled with sandy loam soil collected at Forage Experimental Plot of National Animal Production Research Institute, Shika. Water was added to the soil until there was seepage from the holes drilled at the base of the containers to prevent water logging and continuous moisture was maintained to provide required moisture for germination.

Data Collection and Statistical Analysis

The data collected on seed germination was determined by counting the seeds that germinated daily for 15 days, while dormant seeds are referred to as those seeds that do not germinate after 15 days (Babayemi *et al.*, 2003). The emergence seeds were counted when the shoots emerged above the substratum surface and the number of emerged seedlings were recorded daily and expressed in percentage as described by Nogondar and Azizi, (2013). The emergence rate was calculated according to Maguire's Equation (Maguire, 1967): $M = n1/t1 + n2/t2 + \ldots + n15/n15$ (in days). Seedling length and seedling vigour were determined at 15 days after sowing. The mean emergence time (MET) and seedling vigour index (SVI) were calculated using following formulae:

$$\text{MET} = \Sigma \frac{\text{number of emerged seedlings}}{\text{Day of counting}}$$

The percentage seedling emergence was calculated using the formula:

$$\text{Emergence percentage} = \frac{\text{Total seed emerged}}{\text{Total seed sown}} \times 100$$

$$\text{Seedling vigour index (SVI)} = \frac{[\text{seedling length (cm)} \times \text{germination percentage}]}{100}$$

Data collected were subjected to analysis of variance (ANOVA) using the Statistical Analysis System (2005) software (SAS) and Microsoft Excel (2013). Significant ($P<0.05$) means were compared using Duncan multiple Range Test.

RESULTS AND DISCUSSION

The percentage germination (Figure 1) showed that Sweet elephant grass, Napier grass and King grass recorded over 90% germination. The Beefsteak plant and Zea Mexican recorded 63.33 – 80% germination, Chinese sorghum and Chinese woad recorded between 30 - 43.33% germination and Chinese alfalfa and Wild foxtail millet had 0% germination. The prime characteristics of a good quality seed is high percentage germination, this shows potential of the seed. Poor germination recorded in Chinese alfalfa and wild foxtail plant could be attributed to too long storage or the environmental condition did not favour their germination and emergence as at the time of trial.

The percentage dormancy (Figure 2) showed that seeds of Chinese alfalfa and Wild foxtail millet are 100% dormant during the trial period. Chinese sorghum and Chinese woad recorded 56.67 – 70% seed dormancy, Beefsteak plant and Zea Mexican had 20 -36.67% dormant seeds and the least dormancy of 3.33-6.67 % was recorded in Sweet elephant grass, Napier grass and King grass respectively. Dormancy of these seeds may be due to unfavourable environmental conditions or sometimes a seed may not germinate due to some inhibitory factors of the seed itself.

Emergence rate of the newly introduced temperate seeds is presented (Figure 3). Highest significant ($P<0.05$) germination rate was recorded in king grass > Sweet elephant grass > Zea Mexican schard > Beefsteak plant > Napier grass > Chinese sorghum > Chinese woed in the rates of 29, 26.5, 20.3, 8.5, 7, 6.88 and 1.25 per day respectively. No record was observe for wild foxtail millet and Chinese alfalfa due to no germination.

The seedling length (Figure 4) at 15 days emergence trial was significantly ($P<0.05$) highest (14.0cm) in King grass followed by Zea

mexican, Sweet elephant grass, Chinese sorghum, Napier grass had 10cm, 9cm and 8cm seedling length, respectively while the least was 4cm recorded from beefsteak plant. The performance of most temperate grass reported in this study were similar to *Cenchrus* and *Chloris* species as reported by Amokanye *et al.*, (2000) who reported the performance of 61 forage species appropriate for sub-humid zone of Nigeria.

The seedling vigour index (Figure 5) at 15 days after sowing was highest in King grass (13.53), while Sweet elephant grass, Zea Mexican grass, Napier grass, Beefsteak plant, Chinese sorghum, Chinese woad had 8.7, 8.0, 7.47, 2.53 and 1.99 seedling vigour index respectively. Chinese alfalfa and wild foxtail millet had no record of vigour. Seedling vigour is an important quality parameter which needs to be assessed to supplement germination and viability test on the performance of a seed at the field or storage (ISTA, 2015). King grass is more vigorous than the other plant species, this may be due to higher seedling length and germination percentage observed during trial.

CONCLUSION AND RECOMMENDATION

Among the germplasms studied, King grass had the highest germination and emergence performance > Sweet elephant grass > Napier grass > Zea Mexican schard > Beefsteak plant > Chinese woad > Chinese sorghum. These forages can be adopted in sub humid zone of Nigeria for improved animal production. It could be recommended that multi locational trials should be conducted in various ecological zones to determine their adaptability.

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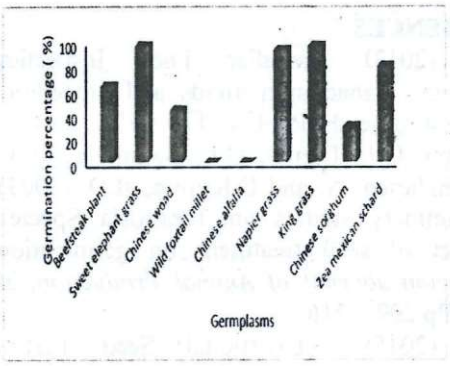

Figure 1: Shows the percentage germination of nine newly introduced temperate seeds to Shika environment.

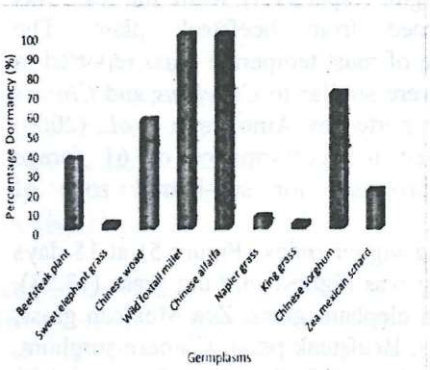

Figure 2: Shows the percentage Dormancy of nine newly introduced temperate seeds to Shika environment.

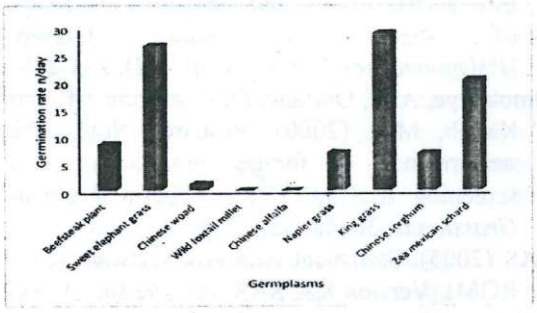

Figure 3: Shows the percentage germination rate of nine newly introduced temperate seeds to Shika environment.

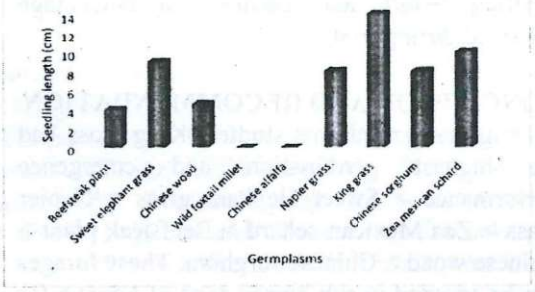

Figure 4: Shows the percentage seedling length of nine newly introduced temperate seeds to Shika environment.

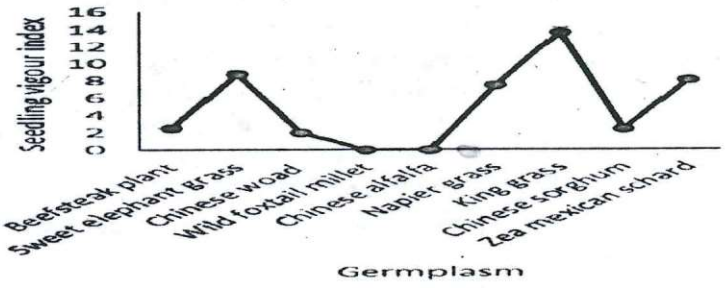

Figure 5: shows the seedling vigour index of nine newly introduced temperate seed to Shika environment