National University of Agriculture

Sciences and Technologies for Sustainable Agriculture (STSA)

ISSN: 1659-5726 (Online) 1659-634X (Print)

https://www.stsa.una.bj/index.php/st

SPECIAL VOLUME (ORIGINAL ARTICLE)

Evaluation of three maize (*Zea mays L.)* varieties for drought tolerance at reproductive stage in greenhouse

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ABSTRACT

Maize (*Zea mays L.*) is one of the most important food and feed crops in the world. But its production is faced by many constraints such as drought. This study aimed to identify drought tolerant maize varieties. Three maize varieties were evaluated based on three irrigation frequencies. Experiment was conducted in randomized block design with 3 replications. Three treatments namely T0 (control) was watered constantly, T1 and T2 stressed plants were watered continuously until they bolted. At bolting, the stressed plants were irrigated at the following frequency: every 6 days (T1) and every 12 days (T2). Fertilizer was applied. Reproduction and yield component parameters were evaluated. Performance of the Stability Index (SPI) and Stress Tolerance Index (STI) were also calculated. Data collected were subjected to one- or two-factor analysis of variance (ANOVA) and means were compared using the Student, Newman, and Keuls test. Statistical analyses were performed using the "JMP Pro 12" software. Results showed that under different irrigation frequencies, FAABA variety recorded a high value for weight of 100 grains (W100g) (33.980 ± 2.90), Stress Tolerance Index (STI) (0.752 ± 0.23) and Stability Performance Index (SPI) (0.752 ± 0.23). Based on Stress Tolerance Index (STI) value, AK 94 variety was the most affected (sensitive) by water deficit contrary to FAABA variety which was the least affected (tolerant). Only SYNEE 2000 variety was moderate, as it has an intermediate behaviour.

Key words: *Zea mays,* water deficit, irrigation frequency, tolerant variety

1. Introduction

Maize (Zea mays L.) is an important crop worldwide with multiple uses (Cheng et al., 2015). Maize grains are widely used for the production of many products such as maize flakes, grain cake, lactic acid, maize syrup, maize oil dextrose, maize starch, gluten and acetone (Aslam, 2013). In addition, maize is consumed as a starchy base in a wide variety of porridges, pastes, grits, beer (Ba, 2017). Maize is a main crop used as food and as feed for poultry, pigs, cattle (Boone et al., 2008) and its grain demand is still dramatically enhanced due to the consumption by poultry and livestock industries. It also serves as raw material for some industries (brewing, soap and oil factories) (Boone et al., 2008). Humans also consume maize grains in the form of fresh or processed food. Apart from the function of being a subsistence food, maize is also traded both within the country and to sub-regional markets (Boone et al., 2008). It is one of the major cereals produced in Africa, covering an average harvested area of 37 million hectares with average production quantity of about 70 million tons per year (Ba, 2017). In Benin, maize is widely cultivated in all the districts with diverse importance and remains the number one cereal produced, followed by sorghum, rice and millet (Semassa et al., 2016), with 3/4 of the total country's cereal production (MAEP, 2010). Thus, maize plays a crucial role in human diet in Benin and based on the different destinations, maize is used in various forms (Adégbola et al., 2011; Balogoun, 2012). Despite maize's importance demonstrated in the Beninese agricultural system (Salami Hafiz et al., 2015) and its economic and nutritive importance, the crop's production faces many constraints. These production constraints include poor access to agro-inputs, adverse weather condition induced by climate change (Ba, 2017). High intensity of drought risk was the most important risk factor across several countries like Benin (Abdoulaye et al., 2011). As many other crops, maize production is currently threatened by the changing climate that reduces maize farming efficiency (Bassu et al., 2014). Water deficit is the most detrimental environmental stress that adversely affects the maize productivity (Rafique, 2020). Compared to other cereals, maize is also facing many biotic and abiotic constraints in production. These include weeds, insect pest infestation, plant diseases, drought water logging and nutrient deficiency (Joshi, 2005). Besides, drought has appeared as one of the most deleterious factors inducing great decrease in crop yields. Moreover, drought stress is very deleterious reduces the crop growth and development (Shao et al., 2008). Furthermore, very few studies have been carried out on drought tolerance maize in Benin. Benin majorly depends on rain for maize production and with the climate change effects

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Received in Aug 2022 and accepted in Sep 2024

on crops, it is becoming very important to access drought tolerant varieties of maize. The aim of this study is to assess the drought tolerance of three maize (Zea mays) varieties in order to (1) measurethe effect of water deficit on their reproductive state and to (2) determine the Stress Tolerance Index (STI) of each tested variety.

2. Materials and methods

2.1. Plant material and field management

The study included three maize varieties mainly grown in southern Benin. FAABA, SYNEE 2000 and AK 94 with 60; 80; and 90 days of maturity respectively. The experiment was conducted in greenhouse of International Institute of Tropical Agriculture (IITA), Benin station, during the 2021 rainy season. The experiment was conducted in a randomized block design with 3 blocks. The following treatments were applied: T0 (control) was watered constantly, which means every three days given the field's carrying capacity; T1 and T2 stressed plants were watered continuously until they bolted. At bolting, the stressed plants were irrigated at the following frequency: every 6 days (T1) and every 12 days (T2). Fertilization was done following Ceylor/Padyp (2012). NPK (15-15-15 at 250 kg/ha) was applied at seedling stage as a bottom dressing. Urea 46%N (120kg/ha) was applied by splitting the dose into two halves at 15 days and 30 days after sowing.

2.2. Data analysis

Five plants were randomly selected per treatment/block for monitoring or measurements. Vegetative parameters have been collected following (Vasal et al., 1996):

The number of days to 50% male flowering (mF), the number of days to 50% female flowering (fF) and the interval between 50% male and female flowering are all calculated (mfF). This metric measures the effect of water scarcity on the formation of female inflorescences.

The weight of 100 grains (W100g) and grain yield (Y) was calculated at 14% grain moisture.

2.3. Determination of stress indices

In this study, Yi, and Ys are grain yields obtained in the absence and presence of stress, respectively; AYI and AYS are the average grain yields of all genotypes in the absence and presence of stress, respectively.

The tolerance indices were established on the basis of these parameters.

The performance of the stability index (SPI) was calculated according to (Bouslama & Schapaugh, 1984).

$$SPI = {}^{Rs}/_{Ri} \qquad (1)$$

The Stress Tolerance Index (STI) has been defined as a useful tool for determining yield and potentially high-stress tolerance of genotypes (Fernandez, 1992). Then, Fernandez (1992) defines new and improved indicators indicative of stress tolerance STIs derived from mathematical formulas using the same yields under different circumstances.

$$STI = \frac{Ri \times Rs}{(MRI)^2} \qquad (2)$$

In order to evaluate the effect of water deficit on the growth of the three maize varieties, we collected data on the growth parameters, namely: number of days to 50% male flowering (mF50%), number of days to 50% female flowering (fF50%) and the interval at 50% male and female flowering (mfFI50%).

These data were collected on three plants per treatment per block on the day the stress starts, which means at bolting and at the end of the stress on the day of harvest.

Analysis of the effects of stress intensity on the varieties was based on one- or two-factor analysis of variance (ANOVA) as appropriate. Means were compared using the Student, Newman and Keuls test. Statistical analyses were performed using the "JMP Pro 12" software (Grayson et al., 2015).

3. Results

3.1. Overall reproduction parameters of three maize varieties in relation to water/irrigation frequencies.

The results of two-factor analysis of variance (ANOVA 2) of the reproduction parameters such as number of days to 50% male flowering (mF50%), number of days to 50% female flowering (fF50%) and the interval at 50% male and female flowering (mfFI50%) of three maize varieties under different irrigation frequencies (Table 1) showed that the stress effect (water frequencies) was significant ($p = 0.01$) for all the reproduction parameters excepted to the interval of 50% male and female flowering (mfFI50%). In addition, the varietal effect was also significant ($p = 0.05$) for all the reproduction parameters except the interval of 50% male and female flowering (mfFI50%). Therefore, we can establish the comparison of the irrigation frequencies between them independently of the varieties on the one hand and the varieties independently of the irrigation frequencies on the other hand.

Table 1. Two-factors analysis of variance (ANOVA2) of days-to-days to the reproductive parameters of three maize varieties under different irrigation frequencies.

Parameters	Stress	Varieties	Interaction (Stress x Varieties)
mF 50%	8.7059^{**}	4.4706^{*}	0.2353^{ns}
fF 50%	14.0417^{**}	5.2917^{*}	1.0417^{ns}
mfFI50%	1.5833^{ns}	0.3333^{ns}	0.2917^{ns}

F values are given for the effects of the following factors: stress (water frequencies). variety and the interaction between stress and variety. **: significant difference at $p = 0.01$; *: significant difference at $p = 0.05$; ns: not significant difference

Grouped analysis of the irrigation frequencies on the different reproduction parameters (Table 2), showed that the reproduction parameters values evaluated increase more when irrigation frequencies become less (severe treatment at T1 and T2). This increase was significant ($p = 0.01$) under T2 irrigation frequency for the number of days to 50% male flowering (mF50%) and number of days to 50% female flowering.

Table 2. Grouped analysis of irrigation frequencies.

Irrigation frequencies	mF50%	fF50%	mfFI 50%
T0	55.777 ± 0.32[b]	62.111 ± 0.35[b]	6.333 ± 0.23[a]
T1	56.666 ± 0.23[ab]	63.000 ± 0.33[b]	6.222 ± 0.32[a]
T2	57.333 ± 0.28[a]	64.444 ± 0.41[a]	7.111 ± 0.45[a]
Prob > F	**0.003**	**0.0006**	**0.169**

Results from analysis to show the effect of water deficit on number of days to 50% male flowering (Figure 1), reveal that this water deficit caused a non-significant increase in the number of days to 50% male flowering in all plants with a variable response depending on the variety.

The number of days to 50% male flowering increased from 56 days on the control treatment to 57 and 58 days respectively under the T1 and T2 irrigation frequencies, corresponding to an increase of one (1) and two (2) days compared to the control of the FAABA variety. There was an increase of one (1) day for the number of days to 50% male flowering under irrigation frequency T2 compared to T1. For the SYNEE 2000 variety, the number of days to 50% male flowering is the same for T1 and the control 57 and increased to 58 days under T2 irrigation frequencies, corresponding of about zero (0) difference and an increase of one (1) day compared to the control, also respectively. There was a stimulation of one (1) day for the number of days to 50% male flowering under the irrigation frequency T2 compared to T1. In addition, the number of days to 50% male flowering for the AK 94 variety increased from 55 days in the control to 57 days each under the T1 and T2 irrigation frequencies, corresponding to an increase of about two days (2) compared to the control in both cases. It appears that under water deficit, the varieties FAABA and AK 94 were the most affected by the numbers of days to 50% male flowering under difference irrigation frequencies.

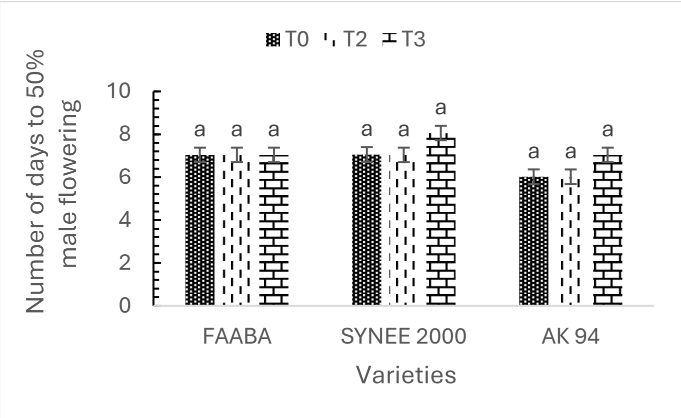

Figure 1. Number of days to 50% male flowering of 3 maize varieties after forty-nine (49) days of cultivation in the greenhouse with irrigation frequencies.

Water deficit on the number of days to 50% female flowering (Figure 2), showed that this water deficit led to a significant (p = 0.05) increase in the number of days to 50% female flowering in all plants of all varieties except FAABA. The number of days to 50% female flowering (fF50%) of FAABA varieties increased from 63 days in the control to 63 and 64 days respectively under irrigation frequencies T1 and T2, corresponding to no difference of zero (0) and increase of one (1) day compared to the control while the number of days to 50% female flowering (fF50%) of SYNEE 2000 variety increased from 63 days in the control to an increase to 64 and 66 days respectively under the T1 and T2 irrigation frequencies corresponding to increases of one (1) day and three (3) days compared to the control. There was an increase of two (02) days in the number of days to 50% female flowering (fF50%) under irrigation frequency T2 compared to T1. About AK 94 variety, the number of days to 50% female flowering (fF50%) increased from 61 days in the control to 63 and 64 days respectively under the T1 and T2 irrigation frequencies corresponding to an increase of two (02) days and three (03) days compared to the control. There was an increase of one (01) day for this parameter under irrigation frequency T2 compared to T1. Thus, it appears that under the irrigation frequencies, SYNEE 2000 and AK 94 varieties were significantly (p = 0.05) affected by the number of days to 50% female flowering (fF50%).

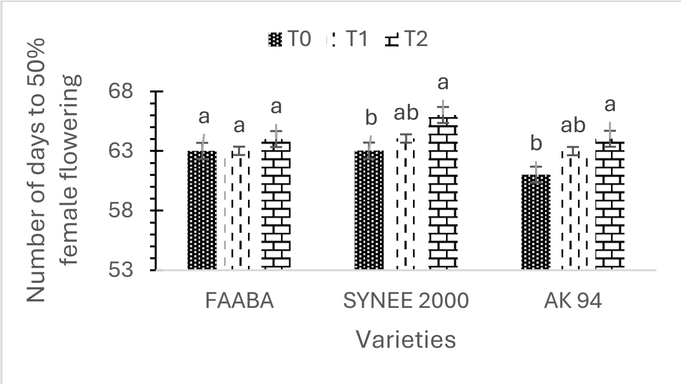

Figure 2. Number of days to 50% female flowering of 3 maize varieties after forty-nine (49) days of cultivation in the greenhouse under the irrigation frequencies.

Figure 3 showed that the effect of the water deficit resulted in a non-significant increase of the 50% Flowering Interval of male and female flowering (mfFI50%) in all plants with a variable response depending on the variety. The interval of 50% male and female flowering (mfFI50%) was 7 days in the control and also 7 and 7 days respectively under the T1 and T2 irrigation frequencies for FAABA variety on the one hand and 7 days in the control, 7 and 8 days respectively under the T1 and T2 irrigation frequencies corresponding to zero (0) day difference and increase of one (01) day respectively compared to the control for SYNEE 2000 variety on the other hand (Figure 3). Moreover, the interval of 50% male and female flowering (mfFI50%) for AK 94 variety, increased from 6 days in the control to 6 and 7 days respectively under the T1 and T2 irrigation frequencies corresponding to zero (0) and one (01) day compared to the control (Figure 3). Thus, SYNEE 2000 and AK 94 were the most affected for the 50% male and female flowering interval (mfFI50%) under the different irrigation frequencies.

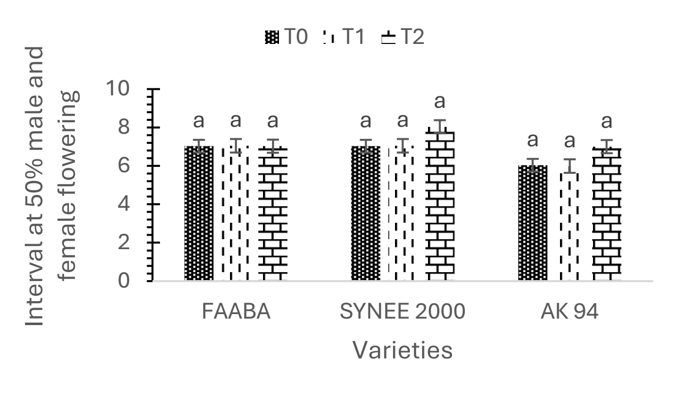

Figure 3. Male and female 50% flowering interval of 3 maize varieties after forty-nine (49) days of greenhouse cultivation under 3. 6 and 12 days of irrigation frequencies.

From the above study, it appears that FAABA variety had showed the best responses (less affected) in terms of the three reproduction parameters evaluated (mF50%; fF50% and mfFI50%). AK 94 variety followed by the variety SYN EE 2000 presented the worst and bad responses (more affected) respectively for these same parameters.

3.2. Overall weight of 100 grains (W100g) and yield per hectare (R/Ha) of three maize varieties with respect to water frequencies.

The results of two-factor analysis of variance (ANOVA 2) of weight of 100 grains (W100g) and Yield per Hectare (Y) of three maize varieties under different irrigation frequencies (Table 3) showed that the stress (irrigation frequencies) was significant for all yield components: (W100g) ($p = 0.05$), (Y) ($p = 0.001$), varieties and the interaction between stress and varieties (Stress x Varieties) was respectively significant for weight of 100 grains (W100g) ($p = 0.05$) and (Y) ($p = 0.001$). The effect of irrigation frequencies was analysed independent of the varieties on the one hand and the varieties were also analysed independent of the irrigation frequencies on the other hand (Table 3).

Table 3. Two-factors analysis of variance (ANOVA 2) of weight of 100 grains (W100g) and yield per hectare (Y) of three maize varieties under different irrigation frequencies.

Parameters	Stress	Varieties	Interaction (Stress x Varieties)
W100g	9.5842**	5.7760*	4.312*
Y	63.0111***	41.2936***	34.0913***

Grouped analysis of the maize varieties on the weight of 100 grains (W100g) under different irrigation frequencies (Table 4) showed a significant difference ($p = 0.05$) for this yield component within varieties. FAABA variety had the highest weight while the SYNEE 2000 had a low weight. In addition, FAABA variety was less affected for the weight of 100 grains (W100g) under different irrigation frequencies. However, SYNEE 2000 and AK 94 varieties were moderately and more affected respectively.

Table 4. Grouped analysis of maize varieties for 100 grains (W100g) weight

Varieties	W100g
FAABA	33.980 ± 2.90^{a}
SYN EE 2000	26.063 ± 2.14^{b}
AK 94	27.183 ± 0.53^{ab}
Prob > F	0.0286

Grouped analysis of different irrigation frequencies on weight of 100 grains (W100g) and yield per hectare (Y) of the three different varieties is presented in Table 5. This table shows that there is a significant difference ($p = 0.05$) between irrigation frequencies. Irrigation frequency of the control (T0) had the highest values for weight of 100 grains (W100g) unlike that of the T1 treatment which had the lowest values. Thus, irrigation frequency T1 has more affected maize varieties. Besides, irrigation frequency of the control (T0) presented the highest values for the yield per hectare in contrary of the T2 treatment which presented the lowest values for yield per hectare. So, it appears that the T2 treatment has a higher effect on maize variety in term of yield per hectare.

Table 5. Grouped analysis of irrigation frequencies on yield component.

Irrigation frequencies	W100g	Y
T0	34.826 ± 2.69a	1037.84 ± 251.40a
T1	24.293 ± 1.69b	604.23 ± 118.93ab
T2	27.884 ± 0.78ab	221.99 ± 31.25b
Prob > F	0.0163	0.006

Irrigations frequencies on the yield per hectare (Figure 4), shows that SYNEE 2000 and AK 94 varieties yield was decreased per hectare unlike to a yield fluctuations per hectare of 27.02% and 76.79% respectively under treatments T1 and T2 compared to the control for FAABA variety. The yield per hectare of FAABA variety is increased from 845.10 kg/ha in the control to 1073.50 and 196.10 kg/ha respectively under T1 and T2 irrigation frequencies, corresponding to increase of 27.02% and reductions of about 76.79% respectively, compared to the control. In other words, there was a 27.02% increase in yield per hectare at T1 compared to T0. In the case of SYNEE 2000 variety, the yield per hectare decreased from 320.44 kg/ha in the control to 314.66 and 136.35 kg/ha respectively under the T1 and T2 irrigation frequencies, corresponding to reductions of about 1.8% and 54.44% compared to the control. The yield per hectare of AK 94 variety decreased from 1947.99 kg/ha in the control to 424.53 and 333.51 kg/ha respectively under the T1 and T2 irrigation frequencies, corresponding to a decrease of about 78.2% and 82.87% compared to the control. Hence, the yield per hectare of AK 94 and SYNEE 2000 variety were most affected by the irrigation frequencies.

For yield components such as weight of 100 grains (W100g) evaluated, FAABA variety had the best response (less affected) while SYNEE 2000 variety had the worst response (more affected) by irrigation frequencies. Conversely, AK 94 variety presented an intermediate behaviour. In the case of the yield per hectare (Y), FAABA variety proved the best response (least affected) while the variety AK 94 presented the worst response (more affected) for the same parameter. The variety SYNEE 2000 however displayed an intermediate behaviour.

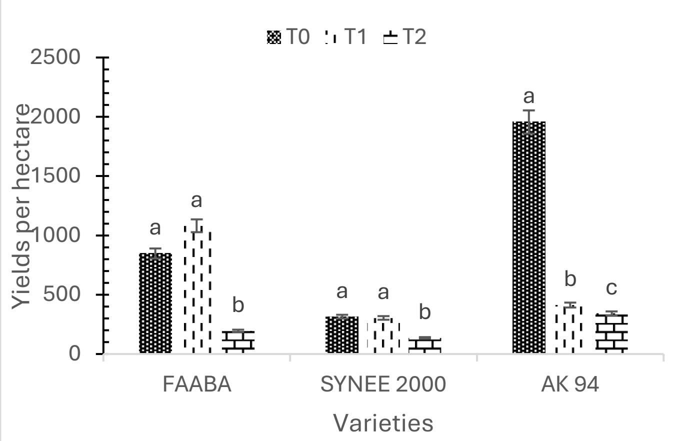

Figure 4. Yield per hectare of three maize variety.

3.3. Overall Stability Performance Index (SRI) And Drought Tolerance Index (DTI) yield of three maize varieties with respect to water frequencies

The results of two-factor analysis of variance (ANOVA 2) of Stability Performance Index (SPI) and Stress Tolerance Index (STI) of yield per hectare (Y) of three (03) maize varieties under different irrigation frequencies (Table 6), reveal that the effect of water deficit on the Stability Performance Index (SPI) and Stress Tolerance Index (STI) was significant (p = 0.001) for the three varieties tested and the responses of the varieties were significantly (p = 0.001) different for the two parameters. The interaction was significant (p = 0.001) for both parameters. The irrigation frequencies were compared without taking into account the varieties on the one hand and the varieties were also analysed independently outside the irrigation frequencies on the other hand (Table 6).

Table 6. Two-factor Analysis of Variance (ANOVA 2) of Stability Performance Index (SPI) and Stress Tolerance Index (STI) of Yield per hectare (Y) of three maize varieties under different irrigation frequencies.

Parameters	Stress	Varieties	Interaction (Stress x Varieties)
SPI	366.5330***	152.8546***	99.6374***
STI	192.7787***	83.0036***	53.0458***

Grouped analysis of Stability Performance Index (SPI) and Stress Tolerance Index (STI) on the yield of three (03) maize varieties under different irrigation frequencies (Table 7) showed a significant difference (p ≤ 0.05) of yield per hectare (Y) to three (03) maize varieties for Stability Performance Index (SPI) and Stress Tolerance Index (STI).

FAABA variety presented the highest value 0.750 ± 0.23a and 0.752 ± 0.23a respectively for Stability Performance Index (SPI) and Stress Tolerance Index (STI). Moreover, AK 94 variety presented more lower value (0.190 ± 0.01) and (0.199 ± 0.01) respectively for Stress Tolerance Index (STI) and Stability Performance Index (SPI). As for SYNEE 2000 variety, it recorded the moderate value (0.703 ± 0.12) and (0.706 ± 0.12) respectively for the Stress Tolerance Index (STI) and Stability Performance Index (SPI). AK 94 variety was therefore more affected (sensitive) by water deficit contrary to FAABA variety which was less affected (Tolerant). However, SYNEE 2000 variety showed an intermediate behaviour, that is, it was moderately affected.

Table 7. Grouped analysis of Stability Performance Index (SPI) and Stress Tolerance Index (STI) on the yield of three (03) maize varieties under different irrigation frequencies.

Varieties	SPI	STI
FAABA	0.750 ± 0.23a	0.752 ± 0.23a
SYN EE 2000	0.706 ± 0.12ab	0.703 ± 0.12ab
AK 94	0.199 ± 0.01b	0.190 ± 0.02b
Prob > F	0.0414	0.0404

4. Discussion

Water deficit is a major problem affecting plant production. It leads to a modification of the expression of many genes (Gaufichon et al., 2010). Three main types of mechanisms namely: tolerance, avoidance and dodging are implemented by plants in response to water stress (Levitt, 1980). Under water deficit, FAABA and AK 94 maize varieties were more affected for the number of days to 50% male flowering under different irrigation frequencies. On the other hand, SYNEE 2000 and AK 94 was also affected by the number of days to 50% female flowering and 50% male and female flowering interval. The reduction of the day of these parameters might be explained by water deficit leading to early flowering. Maize plant is most sensitive at flowering (Westgate & Grant, 1989). According to (Blum Abraham, 1988) advanced or delayed flowering is caused by water deficit and depends on the species. In addition, (Farré et al., 2000) reiterated that maize has been reported to be very sensitive to drought.

The highest value (33.980 ± 2.90) of weight of 100 grains (W100g) obtained for FAABA maize variety under water deficit with different irrigation frequencies, might be explained by the fact that water deficit was not very severe during anthesis stage or water deficit effect is coming just after the pollination for the FAABA variety. (Moser et al., 2006), reported that drought before pollination reduce the seed weight in maize and affected both grain number and 1000-grain weight. Our results are similar to those of (Mahamat et al., 2014) who reported an increase in 100 grains (W100g) weight in cowpea. In addition, obtaining this high weight of 100 grains (W100g) for the FAABA variety could be justified by a good grain filling during the grain formation. This could also be due to a reduction of the number of grains per ear of maize and the good distribution of photosynthates available to these few seeds (Ogbonnaya et al., 2003). Contrary to the high value obtained for weight of 100 grains (W100g) of FAABA maize variety, a low value (26.063 ± 2.14) was recorded for SYNEE 2000 maize variety for the same parameter. Seed weight reduction under drought stress condition might be a result of kernel depth reduction (Khayatnezhad et al., 2011). This result could also be explained by the inhibition of photosynthesis due to water deficit. (Aslam et al., 2013) reported that drought stress reduces the photosynthesis and translocation of photosynthetic assimilates followed by reduced grain filling.

Based on the evaluation of yield per hectare (Y), FAABA variety presented the best response, that is, it was the least affected by drought. This could be due to the potential of this variety which developed many mechanisms to face drought stress. Abscisic acid assists the plant to face the drought stress (Aslam, 2013). Also, drought did not have a severe effect on the flowering stage of this variety. Besides, AK 94 presented the worst response (most affected) for the same parameter while SYNEE 2000 variety presented an intermediate behaviour. The drought stress was more pronounced on AK 94 variety; hence it was found to be the most affected variety out of three varieties evaluated. In maize, grain yield reduction caused by drought ranges from 10 to 76% depending on the severity and stage of occurrence (Bolaòos & Edmeades, 1993). (Aslam, 2013) reported that in the drought stressed maize plant, pollination may be successful, but abortion of kernels takes place few days later.

AK 94 variety may have been greatly affected by stress throughout its cycle (the pre-flowering, flowering, post-flowering). According to (Nejad et al., 2010), water stress induced at the pre-flowering, flowering, post-flowering stages, compared to control plants decreased maize yield by 21%, 5%, 25%, respectively. This decrease was might be due to reduced production of photosynthates under water deficit conditions (Anjum et al., 2003; Wahid et al., 2005).

The highest value (0.752 ± 0.23) of Stress Tolerance Index (STI) and Stability Performance Index (SPI) recorded for FAABA maize variety implies that this variety could be the most tolerant variety among the three maize varieties evaluated in this study, to water stress under the different irrigation frequencies. Where there is drought stress, the development of drought tolerant crop varieties, is the best way for crop production, yield improvement and yield stability (Golbashy et al., 2012). The higher value of Stress Tolerance Index (STI) for a genotype, the higher its stress tolerance and yield potential (Fernandez, 1992). Stress Tolerance Index (STI) could help to discriminate drought resistance maize genotypes. Unlike FAABA variety, the low values of Stress Tolerance Index (STI) and Stability Performance Index (SPI) for AK 94 maize variety might be indicative of the sensitivity of this genotype to drought. The use of biotechnology and crop improvement tools can help to improve this type of maize variety.

5. Conclusion

The evaluation of three maize varieties based on reproduction parameters, yield component traits and stress tolerant index revealed tolerant (FAABA) and sensitive (AK 94) variety to drought. This tolerant maize variety could be a starting point for the establishment of a drought tolerant maize variety in Benin in order to fight hunger and to reach the Sustainable Development Goals (SDGs). Moreover, more maize varieties should be investigated. Molecular characterization and many other biotechnology tools could help to study and better understand drought tolerance.

Acknowledgements

The authors are grateful to International Institute of Tropical Agriculture (IITA) that has provided greenhouse and technical support for the experiments.

Conflict of Interest Statement

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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