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RESEARCH ARTICLE

AGRO-MORPHOLOGICAL CHARACTERIZATION FOR LEAF-SPOT RESISTANCE OF SOME LOCAL PEANUT ECOTYPES (ARACHIS HYPOGAEA L.)

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ABSTRACT

Subject description: Groundnuts (Arachis hypogaea L.) occupy an important place in traditional farming systems. However, yields in dry African savannas are less than one ton per hectare in extensive cultivation. These low yields are due, among other things, to precarious rainfall conditions, to the low distribution of improved varieties, but also to the non-development of local plant potential. In fact, compared to local cultivars, very few studies have been made. The exploitation and enhancement of this local phylogenetic potential could contribute to improving the production and productivity of peanuts. It is in this perspective that our work is part of a genetic analysis of the characteristics linked to the yield and resistance to leaf-spot disease of local peanut ecotypes. **The general objective of this study** is to evaluate the performance of local peanut ecotypes collected in three regions of Burkina, by field screening in order to identify the genotypes resistant to leaf-spot and having good yields. **Method.** The experiment was carried out for two years and at two sites Gampela and Farakoba according to the completely randomized three-repeat Fisher block experimental design. Emergence, stocking density, height, wingspan, disease severity, percent defoliation, and yield components were noted. Data from all observations were analyzed using XLSTAT Pro 7.1 statistical analysis software. **Results**. At the end of this study, we could identify two (02) resistant genotypes and three (03) moderately resistant genotypes to leaf-spot. **Conclusions:** These resistant genotypes are an addition to the list of resistant varieties and could be used as a source of resistance in a variety improvement program.

INTRODUCTION

The peanut, *Arachis hypogaea* L., is an annual plant belonging to the legume family. In 2018 its cultivation extended to approximately 27.78 million hectares (USDA, 2019). Groundnut production is mainly carried out in the tropics and subtropics as well as in the warmer regions of the temperate zones of the world (Knoden et al., 2005). The hardiness, the plasticity, the multiplicity of uses of peanuts, make it a very popular oil and protein crop. However, yields in dry African savannas are less than one ton per hectare in extensive cultivation (Schilling, 2001). These low yields are due, among other things, to precarious rainfall conditions, to the low distribution of improved varieties, but also to the non-development of local plant potential. In fact, compared to local cultivars, very few studies have been made. The exploitation and enhancement of this local phylogenetic potential could contribute to improve the production and productivity of peanuts. The preservation of these cultivars is also of capital importance for Burkina, because, it is increasingly noted that the genetic diversity seems to be reduced not only because of desertification but also because of the introduction of improved varieties. which have threatened their survival for several years. Thus, for efficient exploitation of local ecotypes and in order to safeguard them from possible disappearance, it would be necessary to assess the agro-morphological variability of these local ecotypes. This part of our study, which consists of estimating the genetic parameters, agronomic characteristics and resistance to leaf-spot disease of some local peanut ecotypes, falls within this perspective.

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MATERIALS AND METHODS

Experimental sites : The study of the agronomic performance of the genotypes was carried out at the Gampèla (Center Region) and Farako-Bâ (West Region) sites in Burkina Faso. The choice of sites was guided by the predominance of groundnut cultivation in these regions and the climatic conditions favorable to the development of peanut leaf diseases (leaf-spot). The characteristics of the sites are given by the following:

The Gampèla site: The Gampèla experimental site is located 18 km east of Ouagadougou on the Ouaga-Fada axis. Created in 1975, it covers 490 hectares and is under the control of the Nazi Boni University of Bobo-Dioulasso. It is located at 12 ° 22 West longitude and 12 ° 25 North latitude (Figure 1). The region's climate is Sudano-Sahelian. It is characterized by a rainy season from June to October with the maximum rains in August. The average precipitation is 778.6 mm in 2019 and 740.8 mm in 2020. Irregular rainfall is relatively short-lived. The site's soils are very diverse. In order of importance, we note the ferruginous and hydromorphic soils, lithosols, little evolved soils of anthropogenic input and brown euterotrophic soils. The soil pH varies from 5 to 6.3 and presents constraints which are among others the low content of organic matter, the low retention capacity (Sankara, 1997).

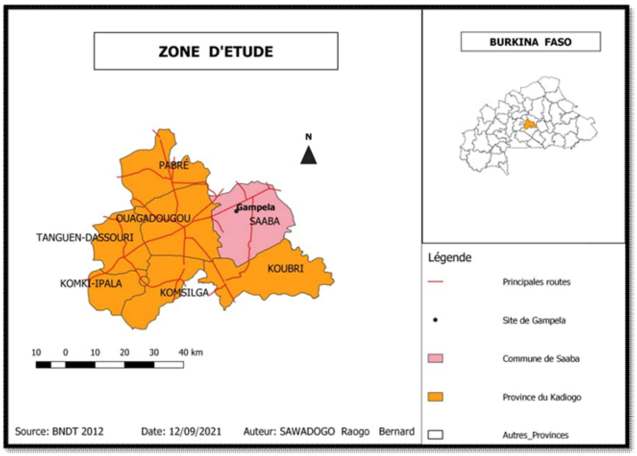

Figure 1. Geographic location of Gampelasite

The Farako-Bâ site: The Farako-Bâ site is located in the west of the country in the experimental station of the Institute for the Environment and Agricultural Research (INERA). Created in 1950, the station is located 10 km from Bobo-Dioulasso on the Bobo-Banfora axis with geographic contacts 04 ° 20 West longitude and 11 ° 06 North latitude (Figure 2). The climate is Sudanese and the rainfall recorded during the two (years) of the experiment varied on average between 1308.5 mm and 1082.3 mm. The rainy season usually starts in early April and ends in November; July, August and September are the wettest months. Average temperatures are around 20 ° C in the cold season and 35 ° C in the hot season. The relative humidity in the rainy season is on average 80%. (Sankara, 1997). The soils of Farako-ba are of the tropical ferruginous type. They are poor in clay and organic matter. These are soils with a sandy loam texture, slightly acidic and poor in nitrogen and phosphorus (Bado, 2002)

Plant material: The plant material used for this study is composed of ten (10) peanut genotypes including five (05) local ecotypes from prospecting and collecting in three regions of Burkina Faso, two varieties BF1, BF2 created by the Burkina Faso cooperation and the United Statesandthree controls from Burkina Faso the variety TS32-1 was used as a control susceptible to leaf-spot, the variety NAMA as a resistant control and CN94C as a yield control.

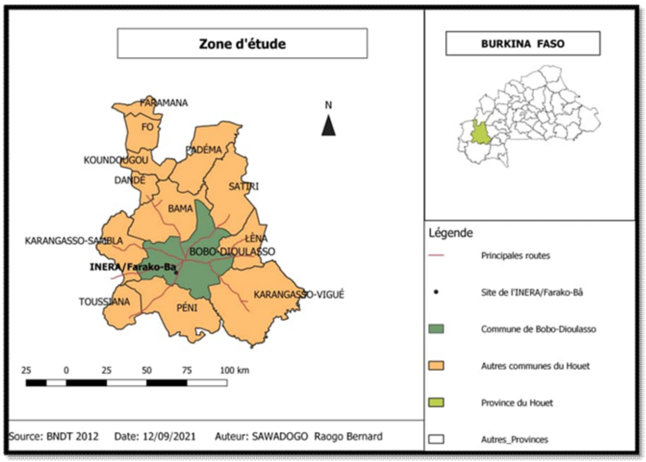

Figure 2. Geographic location of INERA Farako-Bâ site

The characteristics of the different genotypes used are contained in the Table 1.

Table 1. Characteristics of the genotypes used in the experiment

Genotypes	Origin	Botanical type	Cycle	Pods
Nama	Burkina Faso	*Virginia*	120	small
TS32-1	IRHO	*Spanish*	90	medium
CN94C	INERA	*Spanish*	90	medium
BF1	BF/USA	*Virginia*	120	small
BF2	BF/USA	*Virginia*	120	small
Mayoro	Center-east/BF	*Spanish*	90	small
Zampou	Center-east/BF	*Spanish*	120	big
Dalga	Center-east/BF	*Spanish*	120	big
Wobgo	Center-north /BF	*Spanish*	120	big
Balole	Center-north /BF	*Spanish*	90	small

IRHO: Institut de recherches pour les huiles et oléagineux, USA : United State of America INERA**:** Institut de l'environnement et de Recherches Agricoles, BF : Burkina Faso

METHODS

Experimental Design : The screening of the genotypes was carried out for two (2) years in the two sites (Gampèla and Farako-Bâ) according to the completely randomized three-repeat Fisher block experimental device. The distance between repetitions was 1 m. Each genotype was sown on an elementary plot of 2 rows of 1.65m each per repetition at the rate of one seed per pocket. The spacing between the lines was 0.50 m and that between the pockets was 0.15 m. To protect the trial, we sowed three rows of the Nama variety (resistant variety) as border lines all around the trial. The trial was oriented from north to south with the first plot beginning in the west with the NAMA variety.

Evaluation of the severity of leaf spot diseases : Late leaf spot disease severity scoring was done at 30 and 105 days after sowing (DAS) (at harvesting maturity) using a modified nine-point scale (Subrahmanyam et al., 1995) **(**Table 2 and Figure 3), where a score of 1 was rated as highly resistant (HR), 2 to 4 as resistant (R), 5 and 6 as moderately resistant (MR), 7 and 8 as susceptible, and 9 as highly susceptible (HS).

Evaluation of the percentage of defoliation : Defoliation is assessed at harvest, so at the stage of maximum loss of leaves. It reflects the degree of incidence of the disease on peanut plants expressed by leaf fall. Thus, on each plot, the measurement is made on the main stems of five plants selected at random.

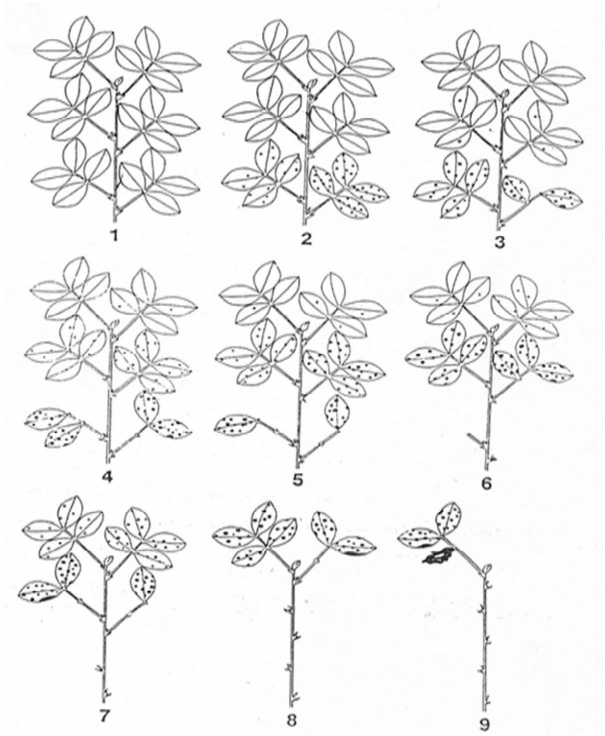

Figure 3. Modified 9-point disease scale for field evaluation of late leaf spot (Rao et al., 1990)

The number of fallen leaves is obtained by counting the leaf locations on the main stem. The percentage is obtained by relating the number of fallen leaves to the number of total leaves (present and absent) reduced to one hundred.

$$\% DE = \frac{Nbr\ of\ L\ fallen}{Total\ Nbr\ of\ leaves} x\ 100$$

% DE: Percentage of defoliation Nbr of L fallen: Number of fallen leaves

Total Nbr of leaves: Total number of leaves

Method for determining the height of the plants (PAH) and the span of the plants (LAP): The height of the plants (HP) in cm was measured from the cotyledonary axil to the terminal bud at the 80th days after sowing (DAS). The measurement, carried out using a graduated ruler, concerned five surrounded plants (plant with its two neighbors on the line) taken at random from the plot. The span or width of the plants (SP) in cm corresponds to the maximum diameter of the 80th DAS plant. The measurement, carried out using a graduated ruler, also concerned the same five plants used for the height measurement

Measure of performance components

Calculation of pod and haulm yield in t / ha : At harvest, the plants are pulled up manually, plot by plot, then stalked and left to dry for a month. The haulms and pods from each plot were then weighed and the haulm and pod yields in tons / ha were deducted.

Calculation of the weight of the 100 seeds : In each plot, a sample of 200g of pods is taken. After shelling, the defective seeds (seeds with holes, attacked; broken, aborted) are removed from the sample. The number and weight of healthy seeds is then determined, then the weight of the 100 seeds is calculated, which is equal to the weight of the seeds divided by their number and reduced to 100.

Statistical analysis : Data from all observations were analyzed using the XLSTAT Pro 7.1 statistical analysis software. A variance analysis followed by an average comparison using the Duncan test at the 5% threshold, made it possible to determine the genotypes that best resist to Sigatoka diseases. Histograms, curves and tables were constructed using the Microsoft Excel 2013 software.

RESULTS AND DISCUSSION

Results

After two (2) years of evaluation of the genotypes at the Gampèla and Farako-Bâ sites, the results obtained are presented by study site. These results concern the density of the stand at 30 days, the level of resistance of the genotypes to leaf-spot, the percentage of defoliation, the yield of pods, plant height and wingspan,the weight of 100 good seeds, the haulm yield.

Results of Farakoba : By performing an analysis of variance on the grouping of trials from two years of experimentation at Farakoba from 2019 to 2020, we obtain in 3, the behavior of the genotypes tested with regard to the characteristics studied. The analysis of variance provides information on the existence of variability in the genotypes for all the traits studied at this site, which results in highly significant degrees of significance. For all traits, the behavior of genotypes is the same from year to year; hence the zero-year genotype interaction for these traits

Stocking density : The average population density is (81.67%). The best density is obtained by the BF2 genotype with 93.18% which is statistically equivalent to seven (07) other genotypes. The lowest population density was obtained by the Wobgo (68,18) and Dalga (61,36) genotypes).

Plant height and wingspan : Analysis of the data collected according to the Ducan test at the 5% threshold showed a significant difference in the height and width of the plants. The height of the plants varies from 46.47 centimeters (Balolé) to 26.44 centimeters (BF1) with an average of 39.69 centimeters (cm). For the width of the plants, the genotype (Dalga) has the greatest value (62.87 cm) and the smallest is carried by the BF2 (48.92 cm), the average being 55.48 cm.

Leaf-spot marks : The average mark for leaf-spot is 6.05. With regard to the ICRISAT scale which has 9 scores, any genotype with a score between 1 to 3, moderately resistant 4 to 6, and sensitive 7 to 9 is considered resistant. In fact, the analysis indicates three groups of genotypes the first group consists of the resistant control NAMA, BF1 and BF2, the second consists of the genotypes Wobgo, Zampou and Dalga, finally the third group consists of the sensitive control TS32-1, CN94C, Mayoro and Balolé

Defoliation : The lowest defoliation was recorded with the genotypes Nama (28.75), BF2 (41.43%), BF1 (44.92%). The strongest defoliation is obtained with the genotypesTS32-1 (97.98%), CN94C (86.77%), Balolé (86.00) and Mayoro

Table 2. Modified 9-point scale used for field screening groundnut genotypes for resistance to late leaf spot

Disease Score	Description
1	No disease
2	Some lesions on old leaves; no defoliation
3	Some small spots mainly on old leaves, very few on middle leaves; defoliation
4	Spots on lower and middle leaves but severe on lower leaves; obvious defoliation of some leaflets on lower leaves
5	Visible spots on lower and middle leaves; yellow and moderate sporulation, fall of some basal leaves.
6	Severe lesions on lower and middle leaves; lesions present but less severe on top leaves; extensive defoliation of lower leaves; defoliation of some leaflets evident on middle leaves
7	Lesions on all leaves but less severe on top leaves; defoliation of all lower and some middle leaves
8	Defoliation of all lower and middle leaves; severe lesions on top leaves; some defoliation of top leaves evident
9	Almost all leaves defoliated, leaving bare stems ; some leaflets may remain, but show severe leaf spots

Subrahmanyam et al., 1995)

Tableau 3. Average performance of the genotypes after two (2) years of testing on the Farakoba site

Varieties	SD	Varieties	leaf-spot	Varieties	DF	Varieties	Height	Varieties	wingspan	Varieties	yield	Varieties	haulm yield	Varieties	W100S
BF2	93.18a	TS32-1	8.50a	TS32-1	97.98a	Balolé	46.46a	Dalga	62.87a	BF1	0.31a	BF1	0.92a	BF1	32.50a
BF1	91.66a	CN94C	7.66a	CN94C	86.76ab	CN94C	41.51ab	Zampou	59.87ab	Nama	0.17b	Nama	0.86a	Nama	31.37ab
Mayoro	89.39a	Mayoro	7.58a	Balolé	86.00ab	Dalga	40.75ab	Balolé	59.16ab	BF2	0.17bc	BF2	0.81ab	BF2	31.06ab
Zampou	85.60ab	Balolé	7.50a	Mayoro	85.38ab	Zampou	39.63ab	BF1	58.04ab	Mayoro	0.10bcd	Zampou	0.68abc	Zampou	30.16abc
Balolé	83.33ab	Dalga	6.41b	Wobgo	74.51ab	TS32-1	38.11bc	Mayoro	57.92ab	Zampou	0.10bcd	TS32-1	0.61abc	TS32-1	29.03abcd
Nama	82.57ab	Zampou	6.33b	Dalga	74.16ab	Mayoro	37.14bc	CN94C	54.37ab	Wobgo	0.09bcd	Wobgo	0.60abc	Wobgo	24.98bcd
TS32-1	81.06abc	Wobgo	6.16b	Zampou	66.75bc	Wobgo	36.33bcd	TS32-1	54.28ab	Dalga	0.08cd	CN94C	0.51bc	CN94C	24.68bcd
CN94C	80.30abc	BF2	3.83c	BF1	44.91cd	BF2	32.05cde	Nama	49.86b	CN94C	0.07d	Balolé	0.42c	Balolé	23.69cd
Wobgo	68.18bc	BF1	3.50c	BF2	41.43cd	Nama	28.45de	Wobgo	49.45b	TS32-1	0.07d	Dalga	0.40c	Dalga	22.76d
Dalga	61.36c	Nama	3.08c	Nama	28.75d	BF1	26.44e	BF2	48.92b	Balolé	0.06d	Mayoro	0.39c	Mayoro	22.68d
Average	P<81.667	Average	6.058	Average	68.667	Average	36.691	Average	55.480	Average	0.127	Average	0.624	Average	27,29
Year	P< 0.0001	Year	P<0.001	Year	P<0.543	Year	P< 0.0001	Year	P<0.006	Year	P<0.708	Year	P<0.052	Year	P<0.002
Variety	P<0.0001	Variety	P< 0.0001	Variety	P< 0.0001	Variety	P< 0.000	Variety	P<0.00	Variety	P< 0.000	Variety	P< 0.000	Variety	P< 0.0001
Year*variety	P<0.32	Year*variety	P<0.12	Year*variety	P<0.96	Year*variety	P<0.33	Year*variety	P<0.07	Year*variety	P<0.92	Year*variety	P<0.90	Year*variety	P<0.18

SD: Stocking density, W100S: Weight of 100 seeds, DF: Defoliation NB: The numbers followed by the same letters are not significantly different according to the DUNCAN test at the 5% level

Tableau 4. Average performance of the genotypes after two years of testing on the Gampela site

Varieties	SD	Varieties	leaf-spot	Varieties	DF	Varieties	height	Varieties	wingspan	Varieties	yield	Varietieshaulmyield		Varieties	W100S
BF1	75.00a	CN94C	6.58a	TS32-1	73.01a	Balolé	40.20a	Nama	59.14a	BF1	1.07a	Nama	4.40a	Dalga	43.40a
Nama	73.48a	TS32-1	6.58a	Balolé	71.80a	Mayoro	36.57ab	BF1	56.51ab	Nama	1.01ab	BF1	3.97a	Wobgo	40.88ab
Mayoro	71.21a	Balolé	6.58a	CN94C	69.13a	CN94C	34.12ab	Dalga	55.71ab	BF2	0.91abc	BF2	2.68b	BF2	40.26ab
Balolé	69.69a	Zampou	6.00a	Zampou	66.28a	Dalga	33.25b	CN94C	49.71ab	Balolé	0.72bcd	Mayoro	1.91bc	Zampou	37.28b
BF2	65.90ab	Mayoro	5.91a	Mayoro	65.13a	Zampou	32.72bc	Balolé	49.61ab	CN94C	0.63cd	Balolé	1.83bc	CN94C	36.95b
CN94C	62.12ab	Dalga	5.75a	Dalga	59.16a	TS32-1	31.94bc	BF2	49.06ab	Mayoro	0.62cd	Zampou	1.52c	TS32-1	32.35c
Zampou	59.09ab	Wobgo	5.50a	Wobgo	58.85a	Wobgo	31.61bc	Zampou	46.24ab	Zampou	0.58d	Wobgo	1.45c	Balolé	31.56c
TS32-1	59.09ab	Nama	3.25b	BF1	36.45b	BF2	26.64cd	Mayoro	45.15ab	Dalga	0.53d	CN94C	1.42c	Mayoro	31.33c
Wobgo	54.54ab	BF2	3.16b	BF2	33.98b	Nama	21.30de	TS32-1	43.54ab	Wobgo	0.51d	Dalga	1.32c	BF1	29.36cd
Dalga	47.72b	BF1	3.16b	Nama	32.86b	BF1	18.36e	Wobgo	40.26b	TS32-1	0.50d	TS32-1	1.26c	Nama	26.18d
Average	63.78	Average	5.25	Average	56.67	Average	30.67	Average	49.49	Average	0.71	Average	2.18	Average	34.95
Variety	P<0.002	Variety	P<0,0001	Variety	P< 0.0001	Variety	P< 0.0001	Variety	P<0.007	Variety	P< 0.0001	Variety	P< 0.0001	Variety	P<0.0001
Year	P< 0.0001	Year	P<0,54	Year	P< 0.0001	Year	P< 0.0001	Year	P<0.001	Year	P< 0.0001	Year	P< 0.0001	Year	P< 0.0001
Year*variety	P<0,03	Year*variety	P<0,59	Year*variety	P<0.81	Year*variety	P<0.25	Year*variety	P<0,31	Year*variety	P<0.40	Year*variety	P<0.20	Year*variety	P<0.97

SD: Stocking density, W100S: Weight of 100 seeds, DF: Defoliation NB: The numbers followed by the same letters are not significantly different according to the DUNCAN test at the 5% level

(85.38) which do not show a significant difference compared to the others. genotypes. The average defoliation is 68.67%

Pod yield in t / ha. The pod yield is on average 0.12 t / ha at this site. The CN94C and Balolé genotype gave the lowest yield (0.06 t / ha) while BF1 recorded the highest yield (0.31 t / ha). The best genotypes concerning the yield are: BF1, BF2, the resistant control Nama (0.17), Zampou (0.11).

The weight of 100 seeds : The weight of 100 seeds varies according to the genotypes from 22.68 g (Mayoro) to 32.50 g (BF1). It averages 27.29g on this site. The BF1, Nama, BF2 and Zampou genotypes recorded the highest 100 seeds weight with 32.50 respectively; 31.37,31,06 and 30.16.

Haulm weight : The average haulm yield per genotype varies from 0.39t / ha (Mayoro) to 0.92t / ha (Wobgo) with an overall average haulm yield of 0.62t / ha. The BF1 genotype observed the highest haulm yield 0.92t / ha, and the lowest yield was obtained by the Mayoro genotype with 0.39t / ha.

Results of Gampela : By performing an analysis of variance on the grouping of trials from two years of experimentation at Gampela from 2019 to 2020, we obtain in Table IV , the behavior of the genotypes tested with regard to the characteristics studied. The analysis of variance provides information on the existence of a highly significant difference for the traits: leaf-spot rating, defoliation, height, yield, haulm yield, 100-seed weight, and significant for the traits stocking density, and wingspan. There are significant interactions between genotypes and stocking density, which means that genotypes behave differently from year to year for this trait. For other traits, the behavior of genotypes is the same from year to year; hence the zero year genotypes interaction.

Stocking density : The average population density is very low (63.78%). The best density is obtained by BF1 with 75% which is statistically superior to the other genotypes marked by values between 47.72% for Dalga and Nama with 73.48%. The sensitive control expressed a stocking density of 59.09

Leaf-spot marks : The average mark for leaf-spot is 5.2. According to the 9-point scale, is considered resistant any genotype with a score between 1 and 3, moderately resistant when the score is between 4 and 6 and sensitive for scores 7 to 9. As a result, it can be seen that the present genotypes are subdivided into three groups. The first group with a score of 3 is composed of the resistance control NAMA which is not significantly different from BF1, BF2. The second group is that of sensitive controls (TS32-1 and CN94C) with scores close to 7 and which are not significantly different from Balolé and Zampou; then the third group made up of moderately resistant genotypes because their scores are between 4 and 6 is made up of Mayoro, Dalga, Wobgo.

Defoliation : NAMA is the least defoliated variety with 32.87%; it is statistically equivalent to the BF2 (33.98%) and BF1 (36.45%) genotypes. The strongest defoliation is obtained by the TS32-1 genotype with 73.02%.

Plant height and wingspan : The average plant height is 30.67 cm. On the one hand, the Balolé genotype has the highest plant height with 40.20cm, followed by Mayoro (36.57), CN94C (34.12 cm) and On the other hand, the smallest size was recorded by the BF1 with a height of 18.36cm followed by the NAMA (21.30cm). Regarding the wingspan of the plants, there was no significant difference between them. The average is 49.49.

Pod yield in t / ha : The average yield for the two cumulative years is 0.71t / ha. The difference between the genotypes is highly significant (P = 001). The highest yield is held by BF1 which is not that different from the control of resistant Nama and BF2.
The lowest yield is held by the sensitive control TS32-1, Wobgo, Dalga, which are not significantly different from the other genotypes, with pod yields varying between 0.50t / ha and 1.07t / ha.

Weight of 100 seeds : The average weight of 100 seeds is 34.95g. Three statistically equivalent Mayoro (31.33), BF1 (29.36g), and NAMA (26.18g) genotypes have the lowest weights for this trait. Except the Balolé genotypes with a value of 31.56g and TS32-1 (32.35g), the other genotypes have higher than average weights.

Haulm weight : The average haulm weights over the two years combined is 2.18t/ha, varying from 1.26 to 4.40t/ha. The Nama genotype obtained the highest haulm weight 4.40, and the lowest weight was obtained by the TS32-1 genotype with 1.26t/ha.

DISCUSSION

All genotypes tested at the Gampela site have stocking densities below the standard for groundnuts of 80%. These results are in agreement with those obtained by (Neya et al., 2013) who carried out studies under similar conditions with American genotypes. The low stocking densities obtained could be linked to abiotic factors and / or to seed and plantlet diseases caused by certain microorganisms. Indeed, the work of Ezzahiri and Sekkat showed in 2001 that the pathogens mainly made up of A. niger, Rhizoctonia solani, Rhizopus stolonifer, Fusarium spp. and Pythium spp, are responsible for damping off which can lead to no emergence on the one hand and peanut seedling dieback during the vegetative phase on the other. Parameters intrinsic to the seed could also be the cause of poor seedling emergence. Indeed, from one variety to another, the germination capacity varies. It should also be noted that the physiological state of the seed can also influence its germination capacity (Nana, 2009). While in Farakoba the population density averages 81.67%, which is over 80%. This situation could be explained by the rainfall recorded the day before the semi and also by that which follows. Indeed, according to Chilling et al. (2001) the water requirements of peanuts are high when the seed is imbibed. Added to this is the fact that the land on which the cultivation was carried out has not received any previous cultivation. Assessment of plant growth showed variability between genotypes for height at both sites and low variability for plant wingspan at Gampela. This low variability could be explained by a low heterogeneity within these genotypes for this trait. On the other hand, with regard to the variability of the height, it could be linked to the efficiency of interception of solar radiation and especially to the biological efficiency of conversion of this radiation into biomass. Over the two years, the rating average was 5.25 at Gampela and 6.06 at farakoba. These results corroborate with those of Neya in 2013 which found that the site of Gampela in the central region registers low scores compared to the site of Farakoba which is in the West zone with rainfall between 1000 and 1200 mm. Indeed, the disease is favored by high humidity and temperatures of 25 ° C to 30 ° C (Koïta, 2013). Defoliation is a natural phenomenon associated with leaf senescence and is aggravated by factors such as leaf-spot disease and drought.Gampèla, pockets of drought were observed at the end of the season during these two years. These repeated droughts could explain the strongest defoliation recorded at this site. Our results are similar to those of Neya et al. (2013) who worked under the same conditions in Gampela and noted that defoliation accelerates at the end of vegetation (mid-October) when there is a situation of relative drought. This does not rule out the fact that it could be linked to the severity of Sigatoka. Indeed, Hamasselbe et al. (2011); Gaikpa et al. (2015), believe that there is a strong positive (or negative) correlation between the severity of leaf-spot attack and defoliation. This could be explained by their intrinsic ability to fight against leaf abscission (Neya, 2008). For the yield, the average of the genotypes was 0.71t / ha which is low but satisfactory compared to the yield of Farakoba 0.12t / ha. These results corroborate with those of Zagre 2004 who found that the results tend to be better in Gampela, compared to Niangoloko (locality located in the west of Burkina) because of the parasitic pressure (rust, rosette, leaf-spot) strong at Niangoloko and the low water retention in this site (sandy soil). The equipment benefits from better water, nutritional and sanitary conditions in Gampela compared to Niangoloko. In addition, Farakoba's soils have a sandy-silty texture, slightly acidic and poor in nitrogen and phosphorus, its pH varies from 5 to 5.5 (Bado, 2002). The pod yield to haulm yield ratio is 0.19 in Farakoba and 0.32 in Gampela. This value is very low in farakoba, indeed according to Schilling, 1989 the minimum value of this ratio is 0.32. This could be explained by the incidence of leaf-spot which could cause severe leaf drop.

Conclusion

The resistance of genotypes to leaf-spot was assessed by estimating several parameters, which enabled us to enrich our knowledge of these different genotypes. This study, conducted in two agro-ecological sites in the country, namely, Gampela in the Center region and Farakoba in the Hauts Bassins, was carried out over a period of two years 2019 and 2020. We retain in view of the various results obtained, that the site of Gampela is favorable to the cultivation of peanuts compared to that of Farakoba. The pedoclimatic conditions at the Farakoba site are believed to be the cause of the high incidence of leaf-spot disease at the site. Screening of these genotypes shows that they have moderate resistance to the disease. We could say that the genotypes BF1; BF2, have good disease resistance as they are not significantly different from resistant controls in the Gampela site. The genotypes (Dalga, Wobgo, Zampou) show moderate resistance to the disease. The other Balolé and Mayoro genotypes exhibit the same behavior as the sensitive control. These genotypes can be qualified as sensitive genotypes. There was then a slight increase in scores at Farakoba due to the incidence of the two leaf-spot diseases, especially the late one. Thus, a genotype can be sensitive in one environment and resistant in another. This work enriches the genetic basis of varieties resistant to leaf-spot. However, since phenotypic variability is influenced by the environment, it is necessary to study the molecular polymorphism of these genotypes. This will help identify markers that are associated with resistance to leaf-spot, leading to the following study which focuses on the molecular characterization of the ten peanut genotypes previously used in agro-morphological characterization.

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