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Screening of 44 cowpea accessions in greenhouse for resistance to charcoal rot.

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ABSTRACT
Objective: The use of resistant cultivars is the appropriate solution to control cowpea charcoal rot caused by the fungus *Macrophomina phaseolina*. However, these cultivars are not widely available. This study aims to assess the status of 44 cowpea accessions from Burkina Faso germplasm for resistance to charcoal rot.
Methodology and results: Seeds were sown on a substrate inoculated with an *M. phaseolina isolate,* in the presence of a control. Data collected included emergence, pre- and post-emergence damping-off, and disease severity, assessed 8, 21, and 45 days after sowing, respectively. Results revealed that at Logofrousso , entry recorded the lowest pre-emergence damping-off rate (8.33%). No dead plants were noted on eight entries, while 23 simultaneously recorded between 5 and 26% mortality. According to disease severity, only one entry (Kvx414 22-72) was resistant, 13 moderately resistant, 19 moderately susceptible, and 11 susceptible.
Conclusion and application of results: Sources of resistance were identified at the end of this study. They could be directly used by producers or used in the breeding program to improve the resistance of existing varieties or create new varieties resistant to charcoal rot.
Keywords: cowpea; charcoal rot; *Macrophomina phaseolina*; resistant cultivars; Burkina Faso.

INTRODUCTION
Macrophomina phaseolina is a soil-dwelling fungus of the family Botryosphaeriaceae with a wide host range (Marquez, al., 2021). This pathogen is responsible for charcoal rot on more than 700 species of cultivated and wild plants (FARR & ROSSMAN, 2020). Among these crops several are of economic importance including maize, sorghum, strawberry, cotton, soybean, sesame, sunflower and cowpea (Zveibil et freeman., 2005; Islam *et al.,* 2012; Ijaz *et al.,* 2013). Cowpea (*Vigna unguiculata* L. Walp) is an important legume widely grown in warm regions of Africa, Asia, North and South America, this could be explained by cowpea's tolerance to drought and its ability to thrive in relatively poor soil conditions (Horn and Shimelis, 2020). Charcoal rot represents the most damaging disease of cowpea today. Symptoms of this disease is observed from the

first weeks of sowing and results in pre- and post-emergence damping-off, wilting of the seedling, attacks on young plants, root rot, as well as blackish spots on the stems with or without sclerotia. Hot and dry climate is a factor that promotes the development of the disease (Salahlou *et al.,* 2016). In unfavorable environmental conditions, *M. phaseolina* produces resistance structures called microsclerotia (conservation structure) that can survive in the soil, crop residues and seeds for 2 to 15 years (Kumar *et al.,* 2016). Given its polyphagy and its mode of dissemination, this fungus is difficult to control. Indeed, microsclerotia are resistant to the application of fungicide and also to solarization (kanaan *et al.,* 2015). In terms of control methods, solarization and the use of chemicals seem to be difficult to implement and too costly for small farmers (Afouda *et al.,* 2012). The application of systemic and/or contact fungicides can limit the damage of this pathogen under experimental conditions. However, seed treatment is ineffective against *M. phaseolina* in case of heavy soil infestation (Jana *et al.,* 2005). Several authors have reported that varietal resistance seems to be the best solution to effectively control fungal diseases (Özer and Köycü, 2004; Koike *et al.,* 2007; Schwartz and Mohan, 2008; Conn *et al.,* 2012). In view of this, the use of resistant or tolerant cowpea cultivars constitutes the most appropriate control measures against such a pathogen. However, until now, such cultivars are very few available and their resistance is mostly partial. Due to the complexity of pathogen management, this study aimed at the greenhouse evaluation of 44 cowpea accessions against charcoal rot. Therefore, the objective of this study is to identify sources of resistance to charcoal rot in cowpea. More specifically, it will involve screening 44 cowpea genotypes that were selected on the basis of their agronomic characteristics.

MATERIALS AND METHODS

Study site: The research was carried out at the Environmental, Agricultural, and Training Research Center (CREAF) in Kamboinsé, a research facility of the Institute of Environmental and Agricultural Research (INERA). The experiments took place in the greenhouse of the institute's phytopathology lab.

Fungal material: For screening we selected a pathogenic isolate that causes remarkable damage from a previous study aimed at pathogenic characterization of *M. Phaseolina isolates* collected from cowpea seeds. The damage of this isolate is observed at all stages of growth from seed to seedling thus allowing us to better estimate the different effects of the fungus on the accessions.

Plant material: The plant material used for screening consisted of forty-four cowpea accessions composed of thirty-two (32) improved varieties including. The two varieties most prized by producers (Komcallé and Tiligré), ten (10) local and two (02) purified local varieties (Table 1).

Tables 1: List of cowpea accessions used in the evaluation of resistance to charcoal rot.

Order number	Accessions	Type of variety	Order number	Accessions	Type of variety
1	KVx30-309-6G	Improved	**23**	DJOUROUM-LOCAL	Local
2	COW PEA BAGUETTE	Improved	**24**	IT93K-693-2	Improved
3	KVx414-22-2	Improved	**25**	HTR	Improved
4	NIAOGO LOCAL	Local	**26**	TVU14676	Improved
5	ZOUNGRANA TENGA LOCAL	Local	**27**	KVx 65-114	Improved
6	KOAKIN LOCAL	Local	**28**	GOURGOU	Improved
7	B-301	Improved	**29**	IT86D-1010	Improved
8	SANGA LOCAL 1	Local	**30**	LOGOFROUSSO	Local
9	IT81D-994	Improved	**31**	KVx404-8-1	Improved
10	KVx414-22-72	Improved	**32**	YIIS-YANDE	Improved
11	MOUSSA LOCAL	Local Purified	**33**	NAFI	Improved
12	NIIZWE	Local	**34**	WAONGO-1	Local
13	IT82D-849	Improved	**35**	IFE-BROWN	Improved
14	LOCAL GOROM	Local Purified	**36**	KVx61-1	Improved
15	POBE LOCAL	Local	**37**	TN88-63	Improved
16	KVx396-4-4	Improved	**38**	MOUGNE	Improved
17	SANZI	Local	**39**	KVx745-11P	Improved
18	TILIGRE	Improved	**40**	COMMALL	Improved
19	58-57	Improved	**41**	BAMBEY-21	Improved
20	KN1	Improved	**42**	TVX 3236	Improved
21	KVx421-2J	Improved	**43**	IT85F-2089-5	Improved
22	KVx402-5-2	Improved	**44**	NEERWAYA	Improved

Inoculum production: To produce the inoculum, sorghum grains (100 g per batch) were washed and then soaked in glass Erlenmeyer flasks containing 300 ml of distilled water for about 18 hours. The grains were then drained and autoclaved for 30 min at 121 ° C. After cooling, six (06) mycelial discs of culture of the *M. phaseolina isolate* collected from cowpea seeds of the Tiligré variety from Yako (pathogenic fungal isolate) previously cultured in PDA medium at 28 ° C for 7 days were inoculated into each bottle. The bottles were incubated at 28 ° C in the dark. From the third day, the bottles were shaken daily to standardize colonization and avoid the formation of aggregates. After about 20 days, the sorghum grains were fully colonized, characterized by a black color. The inoculated sorghum grains were then air-dried at room temperature in the laboratory for at least two days and then coarsely ground using disinfected (porcelain) mortars to obtain a powder that will serve as an inoculum.

Soil inoculation and sowing: Soil inoculation consists of amending the soil with the inoculum by incorporating the inoculum into the soil composed of a mixture of soil, sand and manure (2 :2 :1) previously sterilized in an autoclave, at a rate of 2.5 g of sorghum flour inoculum per liter of soil, sufficient quantity to induce the disease. For this experiment, a total of 44 accessions were tested. These seeds were surface sterilized for 3 minutes in a 3% sodium hypochlorite solution, rinsed 3 times with sterile distilled water and air dried for 24 h. 48 previously disinfected cowpea seeds were sown at a rate of 24 per treatment (inoculated and non-inoculated). A total of 4 replicates at a rate of 6 seeds per replicate were made. Sowing was carried out in plastic cells containing approximately 4 liters of inoculated potting soil. Disinfected seeds, sown on the soil having received non-inoculated and sterilized sorghum grains will serve as a control. The cell plates are placed in incubation at 27 °C with alternating lighting of 12 h of light and 12 h of darkness per day, for 7 days, then transferred to the greenhouse. These genotypes were subjected to regular watering every day in order to maintain good humidity.

Data collection: The evaluations were at different dates, 8th, 21st and 45th days after sowing (DAS) on:

- The number of seedlings emerged 8 days after
- The number of dead plants 21 DAS
- Total melts (pre and post emergence) 21 DAS
- Disease severity at 45 DAS

The severity of the disease was assessed on a scale of 1 to 6 described by Popoola *et al.,* (2013) with some modifications, estimating the percentage of discoloration on the whole plant.

- 1 = Immune (S = 0%)
- 2 = Resistant (0% < S ≤ 5%)
- 3 = Moderately Resistant (6% < S ≤ 10%)
- 4 = Moderately Sensitive (11% < S ≤ 20%)
- 5 = Sensitive (21 < S ≤ 50 %)
- 6 = Very Sensitive S >50%

Thus, **the grade 1** is given to plants with the stems and leaves without any visual **symptoms. Score 2** corresponds to **very limited wilting** expressing 5% of the plant tissue wilted. Score **3** to **limited wilting** between 6 to 10% of the plant tissue wilted. **Score 4** is associated with **moderate wilting** with 11 to 20% of the plant tissue wilted. Score **5** expresses **severe wilting,** between 21 to 50% of the plant tissue wilted. Score **6** expresses **very severe wilting,** more than 50% of the plant tissue of the surviving plants wilted, dead plants and ungerminated seeds. For each repetition and per treatment, the average of the scores of the plants evaluated was then calculated.

Statistical Analysis: The data collected, by treatment and by repetition, were entered using Excel software. The analysis of variance of the data was performed using SAS (Statistical Analysis System) software, version 8. The separation of means in case of significant differences in the parameters studied was carried out according to the Duncan test (Duncan Multiple Range Test) at the 5% threshold. For each treatment (or inoculated accession), the average rate of plant emergence was expressed as a percentage of the number of plants emerged on a total of 6 seeds sown. The rate of dead plants after emergence observed by treatment was expressed as a percentage of the number of dead plants on the total number of emerged plants. The severity of the disease obtained by treatment was expressed by averaging the score assigned to each plant in the repetition.

RESULTS

Effect of *M. phaseolina* on emergence at 8 DAS, post-emergence mortality at 21DAS and total melting (pre- and post-emergence) at 21 DAS: The results of analyses of variance indicate that there is a highly significant difference between the different inputs for all the parameters studied with the exception of post-emergence mortality at 21 days after sowing (Table 2). The average germination rates at 8DAS varied from 5.56 to 91.67% for the entries inoculated with the fungus respectively for Djouroum local and Logofrousso. Only one entry (Djouroum local) had a germination rate of less than 10%, Seven (07) entries (Niaogo Local, IT81D-994, KVx396-4-4, KVx421-2J, IT93K-693-2, KVx61-1, NEERWAYA) had germination rates of less than 25%, 19 entries recorded germination rates of less than 50% and the remaining 17 entries had germination rates of more than 50%. For the witness, the average germination rates varied from 55.56 (local Djouroum and Yiisyandé) to 100% for the Komcallé, TN88-63, B301 and KVx414-22-72 entries (Figure 1). The Logofrousso entry had the lowest pre-emergence damping-off rate (8.33%), 7 entries (Niébé Baguette, Sanga Local, KVx414-22-72, 58-57, IT86D-1010, Waongo-1, IT85F-2089-5) had pre-emergence damping-off rates between 26 and 38%, average damping-off rates. The remaining 36 entries had pre-emergence damping-off rates greater than 50%, reflecting their sensitivity to the damping-off effect caused by the fungus. For the entries not inoculated by the fungus B301, KVx414-22-72, TN88-63 and Komcallé had 0% average rates of pre-emergence damping-off while the highest average rates of pre-emergence damping-off were recorded by the entries Yiisyandé and Djouroum Local (44.44%). The remaining 38 entries recorded pre-emergence damping-offs between 4.16 and 42%. Regarding post-emergence mortality for the inoculated entries B301, Sanga Local 1, Gorom Local, Sanzi, KN1, Djouroum Local, KVx404-8-1 and TN88-63 no dead plants were noted (0% mortality), 13 entries (Koakin Local, KVx414-22-72, Moussa Local, Niizwè, Pobé local, KVx402-5-2, IT93K-693-2, Nafi, KVx61-1, KVx745-11P, Komcalé, TVX 3236, IT85F-2089-5) recorded mortalities lower than 5%. Simultaneously 23 entries caused mortality rates between 5 and 26% with the highest rate for the Waongo-1 entry (25%). 13 non-inoculated entries (B301, 58-57, KN1, Djouroum Local, IT93K-693-2, HTR, KVx 65-114, IT86D-1010, KVx404-8-1, Yiis-Yandé, TVX 3236, IT85F-2089-5) recorded 0% post-emergence mortality. For the other entries we noted average mortality rates between 4.16 and 34% with the highest mortality rate for the Neerwaya entry (33.33%) (Figure 2). The total pre- and post-emergence melting of the entries in the presence of the fungus (inoculated) varied from 25% (Sanga local 1 and Logofrousso) to 100% for the Neerwaya variety. Only seven (7) entries caused less than 50% total rotting: these are the entries IT85F-2089-5; KVx404-8-1; Logofrousso; 58-57; KVx414-22-72; Sanga Local 1; and Niébé Baguette. The total pre- and post-emergence melting of the entries in the absence of the fungus (non-inoculated) varied from 4.17% for the TN88-63 and Komcallé entries to 75% for the Nerwaya entry. For this treatment, however, only 4 accessions (Neerwaya; IFE-BROWN; Nafi; IT81D-994) caused more than 50% total rotting. These results show that the fungus *M. phaseolina* caused a reduction in seedling emergence rates.

Table 2: Results of analysis of variance of the effect of inoculation with *M. phaseolina* on plant emergence, mortality and severity of charcoal rot disease.

Source of variation	DDL	SS	F	Probability
Emergence 8 JAS				
Treatments	1	112965.7223	393.72 HS	<0.0001
Entries	43	37635.6951	2.98 HS	<0.0001
Treatments*Entries	43	44160.5595	3.58 HS	<0.0001
Pre-emergence fonts at 8 days				
Treatments	1	113901.8857	397.45 HS	<0.0001
Entries	43	37551.5134	2.98 HS	<0.0001
Treatments*Entries	43	44122.9871	3.58 HS	<0.0001
Mortality 21JAS				
Treatments	1	0.076904	0 NS	0.9807
Entries	43	8994.263281	1.55 S	0.0209
Treatments*Entries	43	5269.126038	0.93 NS	0.5983
Total fonts 21JAS				
Treatments	1	114089.1473	345.92 HS	<0.0001
Entries	43	52836.3719	3.64 HS	<0.0001
Treatments*Entries	43	38832.3355	2.74 HS	<0.0001
Severity 45JAS				
Treatments	1	162.9669564	312.69 HS	<0.0001
Entries	43	97.6338609	4.26 HS	<0.0001
Treatments*Entries	43	53.7087168	2.4 HS	<0.0001

HS = highly significant, **NS** = not significant, **S:** significant

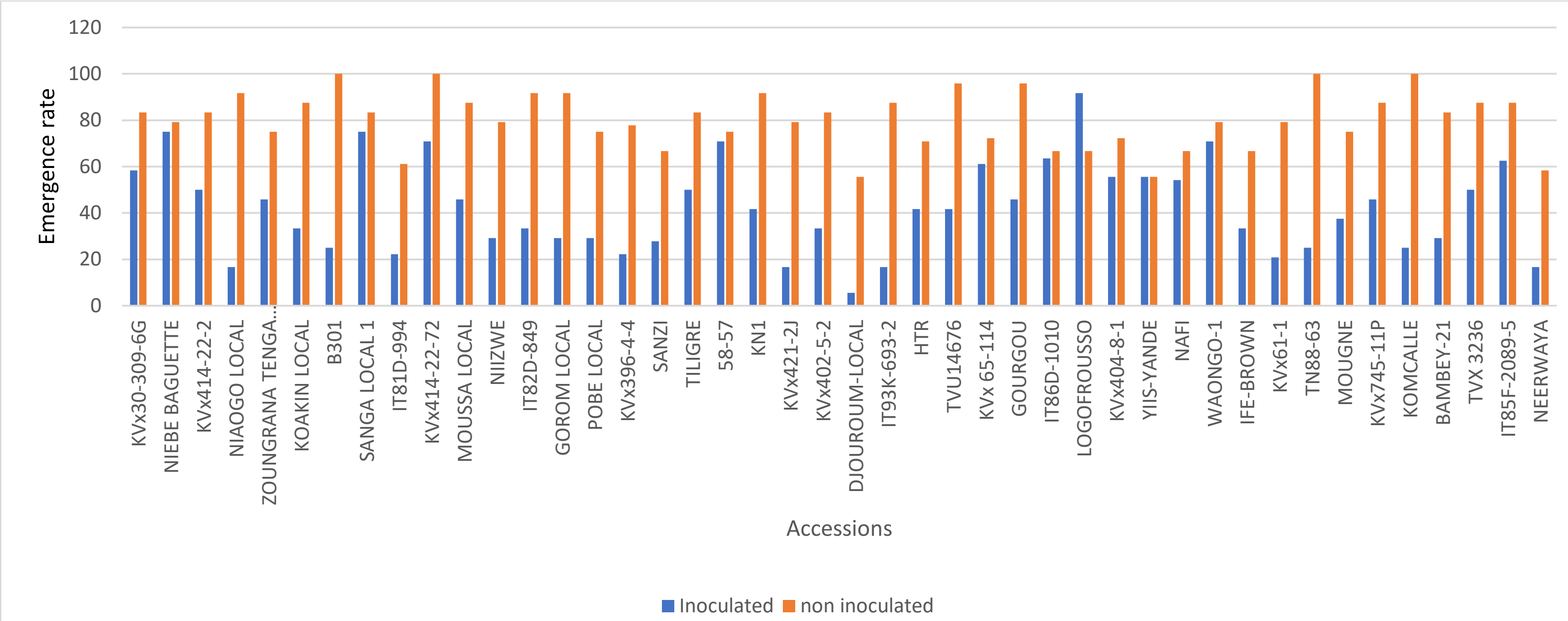

Figure 2: Average emergence rate of inoculated and non-inoculated accessions

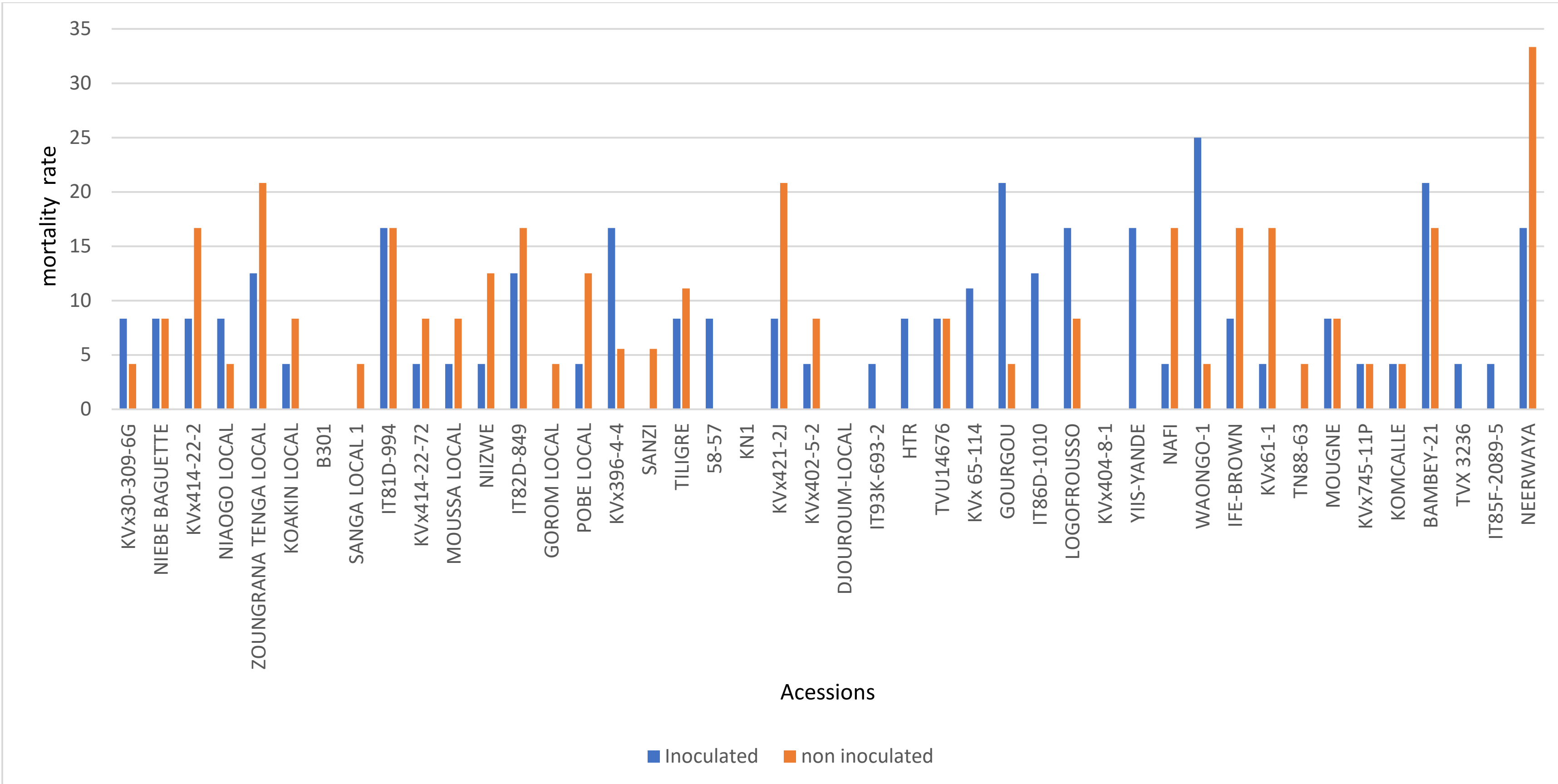

Figure 3 : Histogram of average mortality rates

Response to charcoal rot of 44 cowpea accessions inoculated with *M. phaseolina* (I) or not inoculated (T): Six weeks after sowing, the symptoms observed on plants following inoculation of cowpea with the fungus *M. phaseolina* were mainly failure to emerge, collar rot, chlorotic plants progressing to wilting and drying out (Figure 3). The response of different entries to *Macrophomina phaseolina* infection as reflected by disease severity scores noted 45 days after sowing (Figure 4). A significant difference was observed between the different entries studied. Entry Kvx414 22-72 is the only entry classified as resistant (R) due to a severity score of 2. Entries with a severity score of 3 were classified as moderately resistant (MR), these are 13 entries including KVx 65-114, KN1, Yiis-Yandé, KVx30-309-6G, TVX 3236, KVx414-22-2, KVx404-8-1, Sanga Local 1, IT85F-2089-5, 58-57, KVx745-11P, Logofrousso and Niébé Baguette. Nineteen (19) entries showed marked severity with a score of 4, classifying it as moderately susceptible (MS). The most sensitive (S) entries were Niaogo Local, IT81D-994, IT82D-849, KVx396-4-4, SANZI, KVx421-2J, DJOUROUM-LOCAL, IT93K-693-2, TVU14676, BAMBEY-21 and NEERWAYA categorized with a common severity score of 5 (Table 3).

Figure 3: Symptoms of charcoal rot. **(a)** Failure to emerge; **(b)** Wilting of the seedling; **(c)** Drying of the seedling.

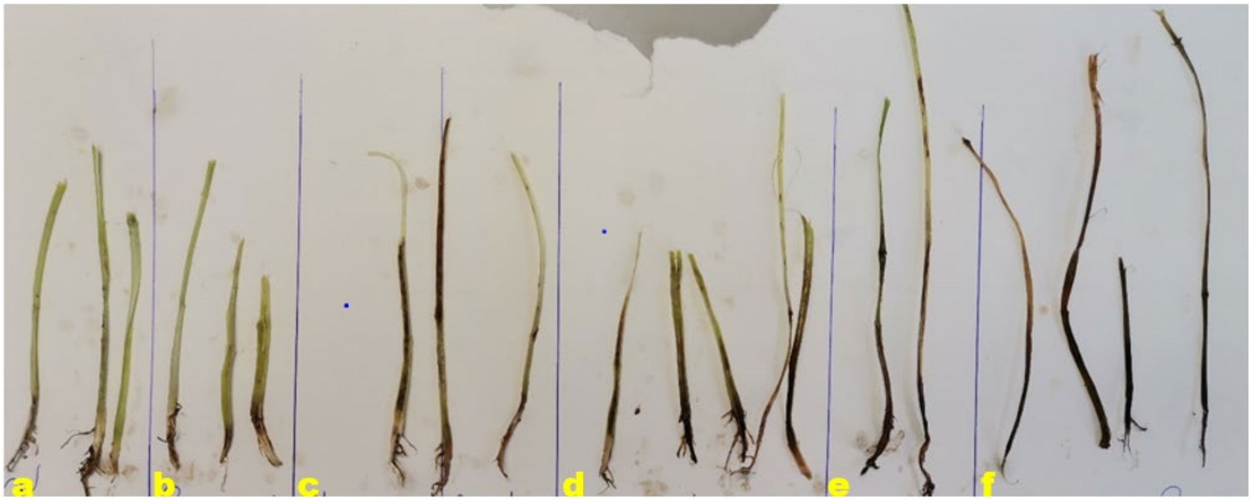

Figure 4: Different levels of rot severity observed on cowpea stems. **(a)**Immune; **(b)**Resistant; **(c)**Moderately resistant; **(d)**Moderately sensitive; **(e)**Sensitive; **(f)** Very sensitive.

Table 3 : Severity indices of the 44 inoculated and non-inoculated accessions.

Varieties	Severity Ratings			Varieties	Severity Ratings		
	I	N I	P		I	N I	P
KVx30-309-6G	3^{DEFG}	$2^{D\ldots I}$	0.0308	DJOUROUM-LOCAL	5^{AB}	$3^{A\ldots E}$	0.0161
COW PEA BAGUETTE	3^{G}	$3^{B\ldots H}$	1	IT93K-693-2	5^{ABCD}	$2^{B\ldots I}$	0.0082
KVx414-22-2	3^{DEFG}	$2^{B\ldots I}$	0.1248	HTR	$4^{A\ldots F}$	$2^{B\ldots I}$	0.0013
NIAOGO LOCAL	5^{ABC}	$2^{B\ldots I}$	0.0338	TVU14676	5^{A}	$2^{E\ldots I}$	<0.0001
ZOUNGRANA TENGA LOCAL	$4^{A\ldots F}$	4^{A}	0.7248	KVx 65-114	$3^{C\ldots G}$	$2^{B\ldots I}$	0.2568
KOAKIN LOCAL	$4^{A\ldots F}$	$3^{B\ldots G}$	0.02	GOURGOU	$4^{A\ldots F}$	$3^{B\ldots H}$	0.0073
B301	$4^{A\ldots F}$	1^{I}	0.0004	IT86D-1010	$4^{A\ldots F}$	3^{ABC}	0.5284
SANGA LOCAL 1	3^{EFG}	$2^{B\ldots I}$	0.0925	LOGOFROUSSO	3^{FG}	$3^{B\ldots G}$	0.7561
IT81D-994	5^{A}	3^{ABCD}	0.0092	KVx404-8-1	3^{EFG}	$2^{B\ldots I}$	0.171
KVx414-22-72	2^{G}	$2^{B\ldots I}$	0.3879	YIIS-YANDE	3^{DEFG}	$3^{B\ldots G}$	0.1318
MOUSSA LOCAL	$4^{B\ldots G}$	$2^{B\ldots I}$	0.0221	NAFI	$4^{A\ldots F}$	3^{AB}	0.4626
NIIZWE	$4^{A\ldots F}$	$3^{B\ldots H}$	0.0614	WAONGO-1	$4^{B\ldots G}$	3^{ABCD}	0.5495
IT82D-849	5^{AB}	$3^{B\ldots G}$	0.0029	IFE-BROWN	$4^{A\ldots F}$	3^{AB}	0.473
LOCAL GOROM	$4^{A\ldots F}$	2^{FGHI}	<0.0001	KVx61-1	$4^{A\ldots E}$	3^{ABC}	0.2894
POBE LOCAL	$4^{A\ldots F}$	$3^{B\ldots H}$	0.0102	TN88-63	$4^{A\ldots F}$	1^{HI}	<0.0001
KVx396-4-4	5^{AB}	$3^{B\ldots H}$	0.0032	MOUGNE	$4^{A\ldots F}$	$3^{B\ldots G}$	0.021
SANZI	5^{ABCD}	$3^{B\ldots H}$	0.0412	KVx745-11P	3^{FG}	$2^{D\ldots I}$	0.0052
TILIGRE	$4^{A\ldots F}$	$3^{B\ldots H}$	0.1287	COMMALL	$4^{A\ldots E}$	2^{FGHI}	<0.0001
58-57	3^{FG}	$2^{B\ldots I}$	0.1158	BAMBEY-21	5^{AB}	3^{AB}	0.0424
KN1	$4^{C\ldots G}$	1^{GHI}	0.0377	TVX 3236	3^{DEFG}	$2^{B\ldots I}$	0.1447
KVx421-2J	5^{AB}	$3^{A\ldots F}$	<0.0001	IT85F-2089-5	3^{FG}	$2^{C\ldots I}$	0.0244
KVx402-5-2	$4^{A\ldots F}$	$2^{B\ldots I}$	0.0056	NEERWAYA	5^{A}	4^{A}	<0.0001
Probability	<0.0001	<0.0001		Probability	<0.0001	<0.0001	

I: Inoculated; **N I:** Non-Inoculated; **P:** Probabilities.

The distribution of the different accessions according to their resistance to *M. phaseolina* based on the severity scores (SS) gave the following percentages (Figure 5):

2% resistant (SS=2)
30% moderately resistant (SS=3)
43% moderately sensitive (SS=4)
25% sensitive (SS=5)

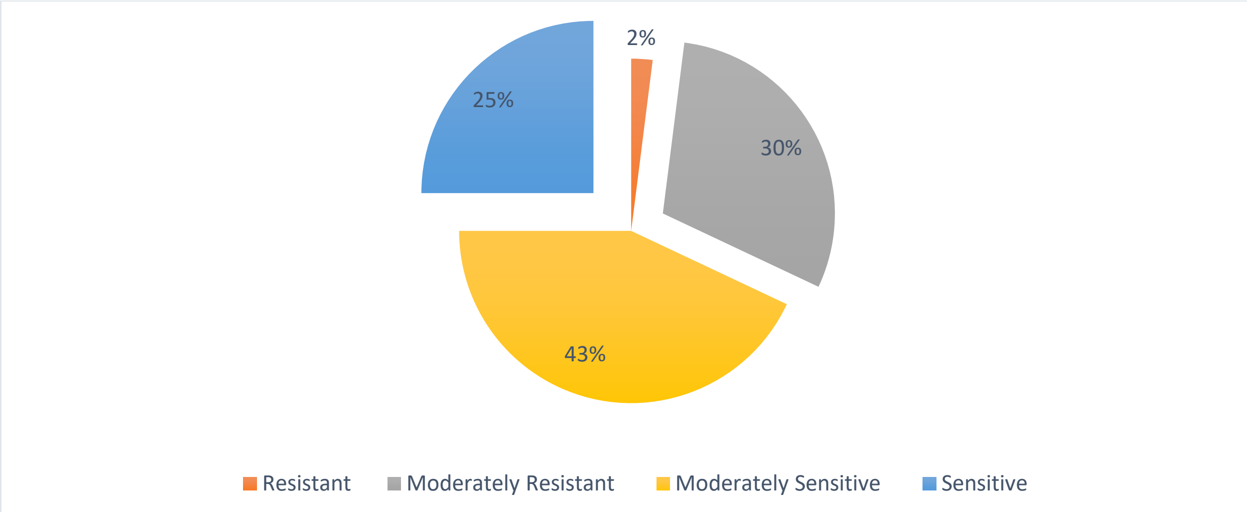

Figure 3: Distribution of accessions according to their resistance**.**

DISCUSSION

Nowadays, one the biggest constraints that hamper cowpea productivity in Data collected Burkina Faso is charcoal rot disease caused by *Macrophomina phaseolina*. This disease is found in all cowpea production areas in Burkina Faso (Baikoro *et al.,* 2023). The symptoms observed on cowpea plants following inoculation with the fungus *M. phaseolina* were collar rot, chlorosis, wilting and complete drying of the plants. These symptoms were similar to those observed by Oladimeji *et al.,* 2012 and Lamini *et al.,* 2020 on cowpea. Singh and Schwartz, 2010 also described similar symptoms observed on common bean (Phaseolus *vulgaris)*. The symptoms of chlorosis and wilting that inexorably lead to plant death are explained by the fact that the pathogen *M. phaseolina* generally affects the fibrovascular system of the roots and clogs the xylem vessels with microsclerotia (Khan, 2007). This reduces the transport of nutrients and water to the upper parts of the plant causing progressive wilting and premature death of the plant (Muchero *et al.,* 2011; Singh *et al.,* 2012; Bodah, 2017). Inoculations caused significant drops in germination rates of up to 94.44% for the local Djouroum entry. This result reflects the effect of pre-emergence damping that the pathogen causes in cowpea. These symptoms of cowpea charcoal rot have also been described by Ouédraogo *et al.,* 2021 and Baikoro *et al.,* 2023. Some authors such as El-Mohamedy *et al.,* 2006 revealed that significant yield losses were recorded following pre-emergence damping caused by some pathogens including *M. phaseolina*. Cowpea charcoal rot is also responsible for post-emergence mortality for this parameter, 8 entries (B301, Sanga Local 1, Gorom Local, Sanzi, KN1, Djouroum Local, KVx404-8-1 and TN88-63) did not record any mortality. This could be due to the fact that these entries do not react to the disease at this stage of their growth. However, 23 other entries recorded post-emergence mortalities greater than 5% and up to 25%. Similar results were reported by Amrate *et al.,* in 2020 on Soybean. According to some authors who have worked on Sorghum, this post-emergence mortality would be the result of the different effects of the disease on the plants which obviously leads to death after emergence (Mughogho and Pande, 1983). Charcoal rot of cowpea caused by *Macrophomina* mainly affects the roots of cowpea, leading to wilting and eventually death of the plant (Pandey *et al.,* 2020). Some accessions experienced significant post-emergence damping-off even when not inoculated with the fungus. This may be due to initial systemic infection of these accessions by *M. phaseolina* or other pathogens resulting in seedling death. Concerning the total pre and post emergence mortalities, it varied from 25% to 100% for the Neerwaya entry. According to the severity scores, the accessions were classified according to their resistance or tolerance status. Of the 44 accessions evaluated for their resistance to *M. phaseolina,* only the entry Kvx414 22-72 was recorded resistant (SS=2), 13 entries moderately resistant (SS=3), 19 moderately susceptible (SS=4) and the remaining 11 entries susceptible (SS=5). The tested accessions displayed variable levels of resistance to charcoal rot disease. In Brazil and Burkina, previous studies have revealed the existence of cowpea genotypes with variable levels of resistance to *M. phaseolina* (Noronha *et al.,* 2010; Lima et al. 2012; Lima *et al.,* 2017; Ouédraogo *et al.,* 2021). However, these disease-resistant genotypes remain in low proportions (Muchero *et al.,* 2011). In our study, accession Bambey 21 showed susceptibility to the *Macrophomina phaseolina* isolate we used, which is consistent with the results of Ouédraogo *et al.,* (2021). However, these results are in contradiction with those of Muchero *et al.,* (2011), who reported that Bambey 21 was resistant. Accessions Pobé Local, KVx 61-1 and Moussa Local were described as susceptible to *M. phaseolina* in this study, this result is similar to the results of Ouédraogo *et al.,* (2021), who also reported the susceptibility of these accessions. In contrast, accessions TVU 14676, IT82D-849 and B301, considered moderately resistant by Ouédraogo *et al.,* were all found to be susceptible to *M. phaseolina* in our study, except for B301, which showed moderate susceptibility. Finally, genotype 58-57, initially described as resistant, showed moderate resistance in this study.

CONCLUSION AND APPLICATION OF RESULTS

Screening of 44 cowpea accessions for resistance to charcoal rot identified varieties with varying levels of resistance/tolerance to the disease. Results revealed that some accessions showed significant resistance, including accession Kvx414 22-72 which was resistant, followed by 13 other moderately resistant accessions such as Niébé Baguette, logofrousso, Yiisyandé. These accessions could provide promising avenues for the development of cultivars fully resistant to *M. phaseolina* . Also, 11 accessions were found to be susceptible to the disease including Djouroum Local, Bambey 21 and Nerwaya. Integrating these resistant varieties into cropping systems can help improve food security, particularly in regions where cowpea is a staple food. This work is an essential step towards integrated management of the pathogen.

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