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Agronomic and biochemical evaluation of some ecotypes of cowpea [*Vigna unguiculata* (L.) walp. (Fabaceae)]Collected in Côte d'Ivoire

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Abstract: This work aims to propose to the peasants producing varieties of seeds, biomass and to determine some physico-chemical characteristics of these seeds. Thirteen agronomic parameters and 8 characters were evaluated. The got results showed an important variability between the ecotypes. The most relevant variables which make it possible to describe variability between the groups are the number of pod, the number of seeds, the weight of the hulls, the biomass, and the rate of filling, the height and the scale. Thus, the varieties N21DR, N10BBrp, N8BRcp, and N18ZRET N9BN produced more seeds whereas the varieties N15ZBoNg and N7BRc produced more air biomass. They can be selected at agronomic ends within the framework of the fertilization of the grounds. The results revealed that the seeds are energy foods, rich in proteins and glucids. On the other hand, they are low in lipids, ashes and have low moisture being able to facilitate their conservation over one relatively long period. The cultivar N1KBN which recorded the highest ash content could be used in the fortification of food. Cultivar white N1KBN recorded the highest content of proteins. Consequently, its seeds could be used to supplement traditional food and to be recommended in the sector of the made up flours. The use of seeds in these fields could contribute to reduce the protein deficits at certain poor populations, in the grip of protein-energy diseases.
Keywords: cowpea, chemical composition, legume, proteins, agro-morphological characterization

INTRODUCTION

Cowpea (*Vigna unguiculata* (L.) Walp) is the most important leguminous plant of the tropical areas of Africa. Its culture plays a very important part in nutritional balance and the economy of the rural populations. It is characterized by its high content in protein; on the food level, it occupies a choice place owing to the fact that it constitutes an important source of proteins and energy for the men and the animals in the developing countries where the access to proteins of animal origins is difficult. Its collection and the characterization of the ecotypes and cultivars local prisoners by the peasants are essential activities in the strategy of conservation of the agricultural biodiversity because of the losses undergone by the existing banks in the country. These losses are primarily due to the bad conditions of conservation. Moreover, the climate changes in particular the shortening of the rain periods involved the abandonment of several local varieties with long cycle. These abandonments were followed of losses of these cultivars thus creating genetic erosion for this culture. Indeed, in most countries, cowpea provides more half of consumed proteins and plays a key function in the food [1]. In Africa, cowpea is cultivated above all for its dry seeds, cooked in the most various forms. In many areas, people consume also his young sheets, fresh or dried, and his immature pods. According to Coulibaly and Lowenberg-Deboer (2002), the West Africa is currently far from meeting its needs in cowpea by its own production. An increase in the production could thus generate important currencies for all the actors of the sector.

In Côte d'Ivoire, although much consumed, cowpea remains a marginal culture. Its production borders the 36,310 T/an, which represents less than 2% of the African production. However, cowpea, because of its content relatively high of proteins should be developed in several fields. There is in particular, the field of flours made up and that of the enrichment of traditional food. Considering its importance, very few data exist on its agronomic and biochemical composition. The use of cowpea in the nutritional one could thus contribute to reduce the many deficits or food deficiencies observed. The objective is to study the agronomic and biochemical parameters of some local varieties of cowpea for purposes to identify the best for a possible production on a large scale and an enrichment of traditional food

MATERIALS AND METHODS

Study Site

The study was carried out at the University Jean Lorougnon Guédé, located in the department of

Daloa. The city is localized in Côte d'Ivoire between the 6° and 7°de Northern latitude and the 7° and 8° of Longitude. These grounds, washed and deep (20 m) are due to abundant precipitations and the fast deterioration of the rocks. The grounds of the region are mainly ferralitic. They are generally very deep with an organic matter high rate. Pluviometers, the temperature and the average humidity of the atmosphere characterizing the site of study during the trial periods from July to October (2014 and 2015) corresponding to the great rainy seasons are respectively: 342.14 mm; 25.97 °C and 84.02.

Experimental Design and Cultural Practice

The vegetable equipment used in this study was made up by seeds of sixteen accessions of cowpea. The various codes allotted to these accessions were made on the basis of number of the accession, the source of seeds, the color of the tegumentary envelope and the shape of seed. The tests were carried out on a surface of 0.25 ha (50 m X 50 m). The experimental device is in complete random blocks with three repetitions. Each block is represented by sixteen elementary pieces comprising the sixteen accessions. Thus, on all three block, 48 elementary pieces (3m X 1.5 m) were installation. The three blocks are separated from 2 m and the pieces inside a block, of 0.5 m. Sowings were carried out at the great rainy season corresponding to the period going from March to July. A density of 81818 /ha was used. Sowings were carried out at a rate of three seeds per seed hole, with a 3 cm depth, with a spacing of 30x30 cm for the density of sowing. Each elementary piece of 4.5 m^2 received 18 points of sowing. Fourteen days after sowing, thinning was carried out in order to preserve only the best plant by seed hole of sowing. After sowing to avoid an invasion of the plants of interests, an insecticidal treatment the lamdor 25 EC at summer carried out, 15 days after sowing

Data collection

All the measures were taken on five feet taken randomly by variety or board in a manual way. The data-gathering begin with the vegetative parameters by counting of the flowers. The counting of the sheets was done starting from the first two sheets of the base of the principal stem on the level of the collet to the last sheets of the end. The determination amongst stem was done by the account of the ramifications resulting from the principal stem. The relative data collection to the scale was done using a ribbon measures by the determination of the distance from each ramification of the two most extreme sheets. That from the height to consist in measuring the distance from the principal stem since the collet to the most extreme sheet. Only the measurement of the dry biomass was given in laboratory by the weighing of each of the five feet after drying with the sun during a time until obtaining constant weight. At the end of the cycle of the plant, the pods are collected per block and elementary piece. After harvest, the number of mature pods per plant was counted. The dry weight of the pods was given after drying with the sun until obtaining a constant weight. The pods were then peeled to count the number of seeds per plant. The weight of seeds and 100 seeds per plant was given. The weight of the empty pods was evaluated. The index of harvest as well as the rate of filling was given. The measured parameters and the methods of measurements are consigned in Table 1. In which concerns the biochemical analyses, the physico-chemical parameters such as the water contents, out of proteins, ashes, glucids, fat and the energy value were given (BIPEA, 1976) [2].

STATISTICAL ANALYSIS OF THE DATA

For each agronomic and biochemical variable, the averages were compared by taking of account the accession through an analysis of the variance with a factor (ANOVA 1). The significance of the test was given by comparing the probability (P) associated with the statistics of the test (<0.05). When a significant difference was observed between the characters, the ANOVA was supplemented by the test of the smallest significant difference (PPDS). This test makes it possible to see the homogeneous groups, being given that it locates us at it level this difference significant is located. The objective of these variance analyses made it possible to reveal the significant differences between the varieties considered thus that the homogeneous groups deriving from ascending hierarchical classifications

RESULTS AND DISCUSSIONS

Results

It is noticed that some is the year of test; the general tendency for the majority of the analyzed variables does not change. Consequently, all the values were combined and only the averages are presented. Accessions N18ZR, N21DR, N11BBoBp and N14BBoBg were not the biochemical object of analysis because they were mixed during transport, therefore not being able to identify them, these analyses were not carried out. On the other hand, the N12KBoBm accessions and N17ZBoNp were not evaluated the morphological parameters because **the seeds have not germinated.**

Comparison of the physico-chemical characteristics of the cultivars

The variance analysis showed that all these variations were significant (p <0, 05) whatever the physico-chemical parameter considered (Table 2). The table 2 presents the average chemical compositions of seeds of each cultivar of cowpea. The moisture of seeds varied 6, 31±0, 02% for the cultivarN4KBNp to 9, 33± 0, 01% (cultivar N12KBoBm). On the level as of ashes, the recorded contents varied 3, 83± 0, 15% (cultivar N15ZBoNg) with 4, 90±0, 05% (cultivar N12KBoBm). The content of fat of seeds varied 1, 95± 0, 08% (cultivar N1) with 4, 01± 0, 16% for the cultivar N2KBoBg. Concerning the content glucids, it varied 61, 44± 0, 14% (cultivar N12KBoBm) with 65, 72± 0, 02% for the cultivar N4KBNp. The content of proteins and the seed energy value respectively varied 20,63±0,02% (cultivar N3KR) with 23,31±0,03% (cultivar N19ZBoBp) and of 362,25±0,86 kcal/100 G (cultivar N13KBoNm) to 375,84±0,78 kcal (cultivar N4KBNp). Consequently, all the physico-chemical parameters of studied seeds (moisture, ashes, lipids, glucids, proteins, energy) differ significantly (with the risk of 5%) between the cultivars. Thus, seeds of the cultivar N19ZBoB pont obtained the highest content of proteins (23, 31± 0, 03%) whereas the cultivar N3KR recorded the lowest value (20, 63± 0, 02%). On the level of the content of fat, cultivars N2KBoBg, N15ZBoNg and N5BBr have recorded the rates highest with respectively 4, 01± 0, 16%, 3, 79± 0, 04% and 3, 65± 0, 06%. While the cultivar N19ZBoBp have obtained the content of ashes (4, 18±0, 05) the most raised, the cultivar N4KBNp recorded the highest energy value. Moreover, the cultivar N17ZBoNp obtained the contents glucids higher.

Comparison of the vegetative parameters of the accessions

The vegetative parameters such as the number of sheet, the number of stem, the scale, the height and the biomass dries were evaluated on the sixteen ecotypes of cowpea studied (Table 3). The results of the analyses showed a significant difference between the varieties for these parameters. No significant difference was observed between varieties N3KR, N5BBr, N6BR, N7BRc, N8BRcp, N9BN, N10BBrp, N15ZBoNg, N18ZR and N21DR for the character number of sheet. The N19ZBoBp variety recorded a more significant number of sheets, while the N15ZBoNg variety had more the small number of sheet. On the level amongst stem, the N10BBrp variety records a small number of stem while the N13KBoNm variety presents the highest number of stem. The varieties N5BBr, N7BRc etN4KBNp are significantly identical for this variable. The N19ZBoBp variety records the greatest scale whereas the N15ZBoNg variety records the smallest scale. With regard to the height of the plant, ten accessions out of sixteen gave identical values. Variety N9BN obtained the greatest height whereas the smallest height was observed with the N10BBrp variety. Variety N21DR produced the largest biomass contrary to the N4BBoBg variety which produced a weak biomass.

Comparison of the parameters of output

Theresults showed a highly significant difference between the varieties for these variables (Table 4). The results of the analyses show that variety N21DR gave a number of pod and seeds highest. On the other hand, the variety N13KBoNm presents more the small number of pods. The results resulting from the statistical analyses show that the N14BBoBg variety presents the most important weight of the pods while the N19ZBoBp variety records the weakest weight of the pods. The weight of the pods is significantly identical between several varieties thus giving a partial difference. Varieties N18ZR, N8BRcp, N21DR, N2BoBg and N6BR gave the highest weight of seeds. The N2BoBg variety obtained the highest weight of one hundred seeds while the N19ZBoBp variety gave the weakest weight of hundred seeds. Varieties N6BR, N8BRcp, N9BN, N10BBrp, N15ZBoNg and N18ZR are significantly identical for the index of harvest. The rate of filling more higherwas observed with variety N18ZR whereas more the low level of filling is given by the N19ZBoBp variety.

Table 1: Method of Measurement of Yield and yield components of *cowpea* in response to landraces

Yield and yield components	Measurement approach and sample size per plot
Plant dry matter: PDM	Recorded at harvest, after drying plants until constant weight, on 30 plants randomly selected
Plant spread: PS (cm)	Recorded 10 weeks after sowing; average of five plants randomly selected in each replicate plot.
Plant height: PH (cm)	Measured from the ground level (at the base of the plant) to the tip of the highest point, including the terminal leaflet. Recorded 10 weeks after sowing; average of five plants randomly selected in each replicate plot
Number of leaves per plant: NLP	Direct counting, six weeks after first flowering on five plants randomly selected
Number of stem per plant: NSTP	Direct counting, six weeks after first flowering on five plants randomly selected
Number of pods per plants: NPP	Direct counting at harvest on 30 plants randomly selected t
Number of seeds per plant: NSP	Direct counting at harvest; average of five plants randomly selected per plant
Hulls weight per plant: HWP (g)	Recorded at harvest, after drying hulls to constant weight, on five plants randomly selected in each
Pods weight per plant: PWP (g))	Recorded at harvest, after drying pods to constant weight, on five plants randomly selected
Seeds weight per plant: SWP (g)	Recorded at harvest, after drying seeds at 12±2% moisture, on five plants randomly selected
Weight percent of seeds: WPS (g)	Recorded at harvest, after drying seeds at 12±2% moisture, weight percent of seeds
Seed harvest index: SHI	Calculated on 5 sets of 50 seeds per treatment, by subtracting the seed weight from the corresponding pod weight and dividing the result by the pod weight.
Pod fill ration: PFR	Ratio between seeds yield and plants' total biomass. Recorded on five plants randomly selected in each treatment bean yield and harvest components

Table 2: Physicochemical characteristics of seeds of varieties of cowpea in Côte d'Ivoire

Variéties	Humidity (%)	Ash (%)	Fat(%)	Carbohydrate (%)	Protein (%)	Energy Values (kcal/100 g)
N19ZBoBp	7,2±0,05^{a}	4,1±0,03^{a}	2,3±0,12^{a}	62,88±0,15^{a}	23,3±0,03^{a}	365,72±0,79^{a}
N2KBoBg	7,9±0,02^{b}	3,9±0,02^{b}	4,01±0,1^{b}	62,90±0,13^{a}	21,1±0,03^{b}	372,46±0,80^{b}
N4KBNp	6±0,02^{c}	3,9±0,1$^{c, b}$	3,3±0,15c	65,72±0,13^{b}	20,64±,08^{c}	375,84±0,78^{c}
N5BBr	7,1±0,01^{d}	4,30±0,01^{a}	3,6±0,06$^{d, b, c}$	63,28±0,56^{a}	21,25±0,06$^{d, b}$	370,99±2,02$^{d, b}$
N8BRcp	7,41±0,02^{e}	4,02±0,02$^{d, b, j}$	3,54±0,21$^{e, c}$	63,73±0,24^{c}	21,31±0,04$^{e, b}$	372,07±0,98$^{e, b, d}$
N9BN	7,68±0,03^{f}	3,88±0,01$^{e, b}$	3,18±0,09$^{f, c}$	64,44±0,15^{d}	20,80±0,07$^{f, c}$	369,63±0,51$^{f, d, e}$
N13KBoNm	8,52±0,03^{g}	4,23±0,01^{a}	2,65±0,15^{a}	63,53±0,07^{e}	21,07±0,05$^{g, b}$	362,25±0,86^{g}
N1KBN	7,96±0,01$^{h, b}$	3,88±0,06$^{f, b}$	1,95±0,08^{a}	64,10±0,07^{f}	22,11±0,07^{h}	362,39±0,56$^{h, g}$
N3KR	7,03±0,01^{i}	4,17±0,02$^{a, j}$	3,61±0,09$^{g, c}$	64,54±0,09^{g}	20,63±0,02$^{i, c}$	373,23±0,45$^{i, b, e}$
N7BRc	7,64±0,01$^{j, f}$	4,00±0,01$^{g, b, j}$	3,28±0,21$^{h, c}$	64,28±0,17^{h}	20,78±0,08$^{j, c}$	369,86±1,02$^{j, d, e,f}$
N10BBrp	8,40±0,01^{k}	4,16±0,01$^{a, j}$	3,27±0,08$^{i, c}$	63,15±0,05^{a}	21,00±0,14$^{k, b,j}$	366,11±0,42^{a}
N12KBoBm	9,33±0,01^{l}	4,90±0,05^{h}	3,52±0,06$^{j, c}$	61,44±0,14^{i}	20,79±0,15$^{l, c ,j}$	360,68±0,21$^{k, g, h}$
N15ZBoNg	7,32±0,03^{a}	3,83±0,15$^{i, b}$	3,79±0,04$^{k, b}$	63,74±0,11^{j}	21,30±0,07$^{m, b}$	374,34±0,49^{l,b,c,e,i}
N17ZBoNp	6,52±0,03^{m}	4,23±0,02^{a}	2,49±0,11^{a}	65,81±0,02$^{k, b}$	20,93±0,09$^{n, f,,j}$	369,39±0,61$^{m, d,f,j}$

Les teneurs avec des lettres identiques dans la même colonne sont statistiquement identiques (risque de 5 %).

Table 3: Characterization of vegetative parameters of several ecotypes of cowpea

Variétés	NLP	NSTP	PS	PH	PDM
N3KR	53.8±15.44^{ab}	6.4±0.54^{gh}	2.66±0.68^{abcde}	1.05±0.15^{bc}	44.2±8.04^{a}
N5BBr	46.2±12.89^{ab}	4.6±0.54^{abcde}	3.55±0.70^{cde}	0.94±0.90^{b}	63.54±7.91^{c}
N6BR	40.8±8.49^{ab}	4.0±0.70^{abc}	3.00±0.37^{bcde}	0.99±0.25^{b}	57.99±14.35^{b}
N7BRc	54.8±25.17^{ab}	4.4±0.89^{abcde}	3.03±1.31^{bcde}	1.19±0.76^{bc}	82.33±8.95^{e}
N8BRcp	48.8±5.93^{ab}	5.2±0.83^{cdefg}	2.48±1.29^{abcd}	1.00±0.46^{b}	73.88±18.54^{d}
N9BN	44.6±15.78^{ab}	4.2±0.44^{abcd}	3.96±0.65^{e}	1.64±0.32^{c}	60.24±7.81^{bc}
N10BBrp	46.8±9.93^{ab}	0.5±1.00^{bcdefg}	1.90±0.71^{ab}	0.76±0.48^{ab}	72.73±26.94^{d}
N15ZBoNg	33.4±11.61^{a}	3.6±1.14^{ab}	1.44±0.56^{a}	0.30±0.06^{a}	4.38±11.01^{d}
N18ZR	45.6±19.16^{ab}	3.2±1.3^{a}	2.29±1.11^{abc}	1.02±0.34^{b}	77.49±37.50^{de}
N21DR	60.4±22.67^{ab}	5.2±2.28^{cdefg}	3.09±10.58^{bcde}	0.93±0.5^{b}	86.53±23.84^{e}
N2BoBg	208.8±76.29^{cd}	5.6±0.89^{defgh}	2.78±1.01^{abcde}	1.05±0.4^{bc}	54.62±9.29^{b}
N4KBNp	151.8±52.89^{abc}	4.4±0.89^{abcde}	3.09±1.12^{bcde}	0.92±0.13^{b}	38.66±19.83^{a}
N11BBoBp	173.4±84.23^{bcd}	5.8±0.83^{efgh}	2.46±0.69^{abcd}	1.09±0.39^{bc}	71.92±4.29^{d}
N13KBoNm	295.0±175.99^{de}	6.8±0.83^{h}	3.18±0.91^{bcde}	0.99±0.33^{b}	68.05±35.18^{bc}
N14BBoBg	237.0±122.03^{cd}	6.2±0.83^{fgh}	2.88±1.05^{bcde}	0.99±0.26^{b}	77.56±22.94^{de}
N19ZBoBp	484.0±280.29^{a}	6.0±1.22^{bcdef}	9.20±5.06^{a}	0.98±0.68^{b}	54.06±31.65^{b}

The abbreviations are defined in Table 1. Mean values within rows by parameter followed by the same superscripted letter were not significantly different at p = 0.05 level, on the basis of the least significant difference test;

Table 4: Characterization of agronomic parameters of several ecotypes of cowpea

Variétés	NPP	NSP	PWP	HWP	SWP	WPS	SHI	PFR
N3KR	19.2±6.76^{c}	241.6±89.48^{de}	25.7±5.11^{bcd}	6.06±2.55^{abc}	15.43±2.72^{de}	10.36±1.1^{de}	0.35±0.11^{cd}	0.6±07^{ij}
N5BBr	17.2±4.14^{bc}	231.6±77.37^{d}	26.65±3.78^{cd}	9.09±1.73^{bcdef}	12.77±2.37^{cd}	11.04±1.02^{de}	0.2±0.04^{abc}	0.47±0.03^{defgh}
N6BR	18.4±3.28^{bc}	240.2±61.50^{de}	27.09±1.30^{cd}	7.02±1.25^{abcde}	15.93±1.00^{de}	9.5±0.26^{cde}	0.28±0.05^{bcd}	0.58±0.03^{hij}
N7BRc	19.80±5.97^{c}	263.2±78.13^{def}	35.62±5.35^{def}	12.53±3.49^{fg}	15.41±3.43^{de}	11.79±3.42^{e}	0.18±0.05^{abc}	0.43±0.12^{cdefg}
N8BRcp	27.6±8.04^{de}	367.00±133.27^{fg}	36.23±15.82^{def}	10.79±5.91^{ef}	19.79±7.80^{e}	9.04±2.11^{cde}	0.27±0.11^{bcd}	0.54±0.05^{ghij}
N9BN	16.80±3.34^{bc}	250.8±80.62^{de}	29.83±6.43^{de}	8.32±1.72^{bcde}	16.96±3.79^{de}	11.41±0.39^{de}	0.28±0.05^{bcd}	0.56±0.03^{hij}
N10BBrp	23.20±7.69^{cd}	355.40±165.71^{efg}	35.10±8.60^{de}	10.37±3.69^{def}	20.15±5.54^{e}	10.80±3.18^{de}	0.28±0.05^{bcd}	0.56±0.03^{hij}
N15ZBoNg	8.00±0.70^{a}	65.20±21.6^{ab}	14.72±2.56^{ab}	7.47±1.84^{bcde}	01.46±0.88^{a}	01.93±1.00^{a}	0.28±0.05^{bcd}	0.52±0.12^{fghij}
N18ZR	27.4±10.31^{de}	381.8±186.62^{g}	34.34±13.7^{def}	9.76±4.94^{cdef}	20.20±5.69^{e}	9.64±1.04^{cde}	0.29±0.11^{bcd}	0.61±0.13^{j}
N21DR	30.6±7.33^{e}	409.8±104.05^{g}	41.23±13.75^{f}	15.21±5.32^{g}	18.49±3.19^{e}	10.81±2.10^{de}	0.21±0.04^{abc}	0.48±0.21^{efghi}
N2BoBg	18.8±1.64^{c}	175.4±35.02^{bcd}	36.04±8.93^{def}	8.27±3.49^{bcde}	19.59±1.96^{e}	18.06±1.34^{f}	0.36±0.04^{cd}	0.55.1±01^{hij}
N4KBNp	11.4±1.34^{ab}	107±17.79^{abc}	25.89±3.11^{cd}	6.53±1.67^{abcd}	8.41±1.04^{bc}	8.51±1.06^{cd}	0.5±0.72^{d}	0.32±0.05^{bc}
N11BBoBp	22±7.84^{cd}	190.2±85.11^{cd}	40.20±14.49^{ef}	9.53±2.96^{cdef}	17.08±5.55^{de}	16.92±4.29^{f}	0.23±0.08^{abc}	0.42±0.04^{bcdef}
N13KBoNm	7.8±3.11^{a}	47.4±22.68^{a}	18.68±7.03^{abc}	5.17±2.10^{ab}	6.71±2.05^{b}	6.74±2.07^{bc}	0.11±0.05^{ab}	0.36±0.06^{bcd}
N14BBoBg	20±2.12^{c}	173.6±19.44^{bcd}	41.38±2.68^{f}	10.19±0.54^{def}	16.67±3.63^{de}	17.18±4.21^{f}	0.23±0.09^{abc}	0.39±0.06^{bcde}
N19ZBoBp	9.2±5.06^{a}	77.8±53.7^{abc}	12.16±7.49^{a}	3.39±2.16^{a}	3.91±2.7^{ab}	4.75±2.46^{ab}	0.08±0.05^{ab}	0.31±0.02^{b}

The abbreviations are defined in Table 1. Mean values within rows by parameter followed by the same superscripted letter were not significantly different at p = 0.05 level, on the basis of the least significant difference test

DISCUSSION

Biochemical characterization

The variance analysis indicated in addition, that each physico-chemical parameter of seeds significantly varied from one cultivar to another. These parameters thus make it possible to make the difference between the cultivars. It is moisture, ashes, the fat, glucids, proteins and the energy value of seeds. The differences in contents recorded on the level as of physico-chemical parameters of seeds resulting from different cultivars can be due to the environmental conditions, the cultivation methods and the genetic factor Chinma *et al.;*[3],Hamid*et al*.**;**[4]. So the seeds of the cultivar N19ZBoBp recorded the highest content of proteins, followed by those of cultivar N1KBN. In general, a high percentage of proteins in cowpeaare desirable for a better nutrition [5]. Consequently, the higher content of proteins of the cultivar N19ZBoBp, gives rise to think that it could be an important source of proteins for the populations. Agbogidi [6] affirmed that, cowpea is the primary source of proteins for the poor populations. This high content is in addition, an indication which its use in human consumption could help to reduce the incidence or which has occurred of nutritional diseases such as the kwashiorkor. Appiah *et al.*,[7]. Moreover, this strong content of proteins makes that cowpea is regarded as an excellent supplement of cereals in Sahelian Africa.Balla *et al.;* Baragé, [8]. Cultivars B1N19P5 mainly and N1KBN incidentally can be recommended for this purpose. The cultivar N19ZBoBp has small seeds of white color with a white eye while N1KBN is a cultivar white-black having large seeds. Hamid *et al.;* [4] studying the characteristics of two varieties of cowpea, reported that the seeds of the black cultivar were richer in proteins that those of the red cultivar. In this study, cultivar red N3KR also recorded the lowest value. Both cultivars (N19ZBoBp and N1KBN) can be also developed in the field of the made up flours. Indeed, taking into account the high cost of the wheat flour imported by the developing countries, substitution partial of wheat by local flours present of many advantages Touko*et al.* [9]. Moreover, products of bakery and pastry making much appreciated by the consumers were obtained in substituent the wheat by a leguminous plant flour in proportions ranging between 0 and 20% Diallo*et al.;*[10]. The cultivar N19ZBoBp presents an additional advantage because of its white color. Indeed, the color is important according to the industrial application, since any pigmentation would have an impact on the finished product and thus its acceptance could be affected Hamid *et al.;*[4]. Moisture relatively high, recorded on the level of the cultivar N12KBoBm, does not represent a true problem for the conservation of its seeds over one long period. Indeed, this value is close to that of 9% of moisture recommended Famata *et al.;*(2013). On the level of the content of fat, the cultivars N2KBoBg, N15ZBoNg and N5BBr recorded the highest rates. These values are higher than that about of lipids, obtained in a variety improved (Nhyira) in Ghana Appiah *et al.;*[11]. The cultivar N12KBoBm has the ash content highest. This value is close to that about 4, 56%, recorded in a local variety in Benin Houinsou *et al.;*[12]. In addition, the highest energy value which was recorded on the level of the cultivar N4KBNp close is obtained in the cultivar in Nigeria. This cultivar is quite as rich in energy as the roots of cassava whose energy values oscillate between 385 and 388 kcal Koko*et al.;*[13]. The relatively high content of ashes of the cultivar N12KBoBm represents an advantage, in the sense that it could be used for the basic traditional food fortification.

Morphological

The study of local accessions of cowpea was enjoying the current status of the diversity of the species in Côte d'Ivoire. The high coefficients of variation observed in a significant number of characters indicate the presence of significant heterogeneity among local accessions of cowpea. The selection of cowpea varieties with good production requires a thorough knowledge of the characteristics of those varieties. This study identified producing varieties of seeds and varieties that could produce large amounts of biomass. Under the experimental conditions, the appearance of flowers is carried out between 39 and 72 days after sowing. These observations brought on flowering show that the flowers appear throughout the vegetative cycle cowpea. The average of 56 days after sowing to flowering recorded sixteen local accessions studied is higher than the results obtained in Benin of 124 accessions of cowpea. These observations are due to environmental and soil conditions. The pods appear two to three days after the appearance of flowers. The early varieties of cowpea are an important agronomic trait that could help deal with climate change phenomena. The production of pods per plant depends on the amount of mineral matter stored by the plant. This production is also due to its ability to convert its minerals into nutrients for proper operation. The time required reaching the flowering and maturity is an important feature for adapting a particular agro-ecological environment for annual species including cowpea. The period between the appearance of the first flowers and ripening pods would be decisive for a successful production of cowpea. Analysis of agronomic parameters such as number of pods, number of seeds, pod weight, seed weight and seed 100, showed great variability within the studied accessions. They are lower than those obtained by Ouédraogo *et al*.; [14] in Burkina Faso on the same species. This difference in weight of 100 seeds was already mentioned by Doumbia *et al*., [15] in a similar study in Ghana on accessions of cowpea. The results could be due to the cowpea sensitivity to changes in photoperiod [16]. Indeed, numerous studies have shown that day length causes varying effects on the vegetative and physiological development of cowpea [17]. Changes in the level of attack of pests and pests have a considerable impact on the performance of cowpea. The presence in the midst of many pests, weeds or diseases cause many severe losses in the production of cowpea seeds. The most important biomass was obtained with the N21DR variety. This variability could be explained by the difference between the varieties used in these two studies. This variety is to promote in the field of soil fertilization

CONCLUSION

It appears from this study that the seeds are energy food, rich in protein and carbohydrates. By cons, they are low in ash, fat and low humidity to facilitate their conservation over a relatively long period. The cultivars N19ZBoBp recorded the highest protein levels can be used in food to fill gaps in protein intake of prey populations to protein-energy diseases in developing countries. About the production, the varieties N21DR, N10BBrp, N8BRcp, N18ZR and N9BN are advised to a farmer for the rapid production and large quantities of cowpea seeds

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