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Moisture correction in pods of cowpea genotypes to estimate yield

Correção da umidade de vagens de genótipos de feijão-caupi para estimativa de produtividade

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Abstract

Moisture correction of fresh pods of cowpea genotypes has been used to correct weight differences of pods from the same harvest. Correction is made by the method of soaking pods and grains in water. This study verifies the need for moisture correction of fresh pods to estimate the yield of cowpea genotypes for production of green grains. Sixteen genotypes were evaluated for pod mass, grain mass, hundred grains mass, grain index, pod yield, and grain yield in two municipalities, Pentecoste and Marco, Ceará State, Brazil. For moisture correction, a sample of ten fresh pods was collected, weighed, and soaked in water. Samples were weighed until constant weight for wet mass. Subsequently, samples were dried in a forced air circulation oven and dry mass was obtained. Finally, a correlation study between the obtained data was performed. Correlation estimates were positive from low to medium magnitude. Correlations of greater magnitude were observed between fresh and dry masses. The original data showed greater representativeness of dry mass, indicating greater experimental precision. Therefore, moisture correction of fresh cowpea grains and pods proved to be unnecessary.

Additional keywords: *Vigna unguiculata,* green grains dry mass.

Resumo

A correção de umidade das vagens frescas de genótipos de feijão-caupi tem sido realizada para corrigir a diferença de peso das vagens em uma mesma colheita. Essa correção é feita pelo método da embebição em água de vagens e grãos. Objetivou-se verificar a necessidade de corrigir a umidade de vagens frescas buscando estimar a produtividade de genótipos de feijão-caupi destinados a produção de grãos verdes. Dezesseis genótipos foram avaliados em dois municípios do Estado do Ceará, Pentecoste e Marco, quanto a massa de vagens, massa de grãos, massa de 100 grãos, índice de grãos, produtividade de vagens e produtividade de grãos. Para a correção da umidade, retirou-se uma amostra de dez vagens frescas, pesou-se e, em seguida, colocou-se de molho em água. Foi realizada a pesagem das amostras até as mesmas atingirem peso constante, obtendo-se a massa úmida. Posteriormente, as amostras foram secas em estufa de circulação de ar forçado, obtendo-se a massa seca. Por fim, realizou-se o estudo de correlação entre os dados obtidos. As estimativas das correlações foram positivas de baixa a média magnitude. Correlações de maior magnitude foram observadas entre as massas frescas e seca. Foi constatado que os dados originais apresentaram maiores representatividades da matéria seca, indicando maior precisão experimental. Portanto, a prática da correção de umidade de grãos e vagens frescas de feijão-caupi se mostrou desnecessária.

Palavras-chave adicionais: *Vigna unguiculata* , grãos verdes; massa seca.

Introduction

Cowpea [*Vigna unguiculata* (L.) Walp.], also named string bean and macassar bean, is a dicotyledon widely produced in the Brazilian Northeast region, where its cultivation is intended especially for the production of dry grains. However, the demand for green grains is growing and becoming more relevant in the market (Ramos et al., 2014). According to Freire Filho (2011), increased demand for green grains occurs due to its use in several dishes of Brazilian Northeastern cuisine and in industrial processing. In addition, the price of green grains exceeds that of dry beans, reaching higher values in the off-season and increasing the profitability of the production system (Nogueira et al., 2019).

Pods and green grains can be harvested when beans reach the soluble solids content for which they are genetically programmed, which occurs at the beginning of physiological maturity. Thus, green-colored grains are obtained, with great acceptability due to smooth flavor and soft texture (Lima et al., 2003). Normally, cowpea is harvested when reaching physiological maturity, that is, just before grains stop photosynthate accumulation and begin the process of natural dehydration. The harvest point is identified by swelling and a slight change in pod color, whether light or dark-colored (Freire Filho et al., 2005).

Difficulty in recognizing the optimal harvest point, especially for genotypes with dark (purple) pods, induces harvesting at different maturation stages, which can promote erroneous yield estimates. Thus, in order to standardize pod weight in harvest, it is necessary to correct moisture in pods through the methodology in which pods and grains are moistened and their wet weight is recorded (Andrade et al., 2010). However, this method must be applied immediately after harvesting, to avoid changes in grain moisture, which often make it laborious and infeasible.

In recent years, research has evaluated cowpea yield for the green grain market (Rocha et al., 2012; Ramos et al., 2014; Sousa et al., 2015; Torres Filho et al., 2017; Souza et al., 2019). However, there are few studies identifying the optimal harvest point for each cultivar, as well as new methodologies to correct grain moisture at harvest. Thus, this study verifies the need for methodologies to correct the moisture of fresh pods to estimate the yield of cowpea genotypes evaluated for green beans.

Material and methods

Sixteen cowpea genotypes were used, listed after their commercial subclasses (white, green, canapu, dark blue and evergreen), obtained from the Embrapa Meio-Norte germplasm active bank of cowpea (Table 1).

Table 1 - Cowpea genotypes evaluated and their respective parents/precedence, mass of 100 grains (M100G) and commercial subclass.

Genotypes	Parental/Precedence	M100G	Commercial Subclass
MNC00-303-09E(1)	(Capela x Costelão) x Costelão	21.3	White
MNC00-595F-2(1)	BR2-Bragança x GV-10-91-1-1	19.5	Green
MNC00-595F-27(1)	BR2-Bragança x GV-10-91-1-1	16.8	Green
MNC05-835B-15(1)	MNC00-599F-2 x MNC99-537F-14-2	18.6	Green
MNC05-835B-16(1)	MNC00-599F-2 x MNC99-537F-14-2	17.0	Green
MNC05-841B-49(1)	MNC00-599F-9 x MNC99-537F-14-2	17.3	Green
MNC05-847B-123(1)	MNC00-599F-11 x MNC99-537-14-2	16.4	Green
MNC05-847B-126(1)	MNC00-599F-11 x MNC99-537-14-2	14.2	Green
MNC99-541F-15(1)	TE93-210-13F x TE96-282-22G	18.2	White
BRS Guariba(2)	IT85F-2687 x TE87-98-8G	19.5	White
BRS Tumucumaque(2)	TE96-282-22G x IT87D-611-3	19.5	White
BRS Xiquexique(2)	TE87-108-6G x TE87-98-8G	16.5	White
Paulistinha(2)	Juazeiro-CE	22.7	Canapu
Vagem Roxa-THE(2)	Teresina-PI	13.4	White
Azulão-MS(2)	Dourados-MS	20.8	Dark Blue
Sempre Verde-CE(2)	Fortaleza-CE	20.2	Evergreen

(1)Lines; (2)Cultivars.

Two experiments were performed in distinct environments in the state of Ceará to evaluate cowpea genotypes in the municipalities of Pentecoste (3º47' S, 39º16' W, altitude of 45.0 m) and Marco (03°06' S, 40°06' W, altitude of 16.5 m).

The completely randomized experimental block design was used with four replications in 5.0 m x 3.2 m plots. The plot consisted of four rows, where only the two central rows (8.0 m²) were considered for evaluation, resulting in eighty plants per plot.

The experimental area was prepared with two harrows for both experiments. Fertilization was performed according to the recommendation based on soil chemical analysis, with the following results for the municipalities of Marco and Pentecoste, respectively: Organic matter (OM) = 3.93 and 4.97 g kg^{-1}; pH = 6.40 and 5.70; P = 6.00 and 3.00 mg kg^{-1}; K = 0.15 and 0.11 $cmol_c$ kg^{-1}; Ca = 0.80 and 1.00 $cmol_c$ kg^{-1}; Mg = 0.80 and 0.90 $cmol_c$ kg^{-1}; Na = 0.05 and 0.05 $cmol_c$ kg^{-1}; Al = 0.05 and 0.10 $cmol_c$ kg^{-1}; H + Al = 0.50 and 1.15 $cmol_c$ kg^{-1};

S = 1.80 and 2.10 $cmol_c$ kg^{-1}; V = 78 and 66%; m = 3 and 5 %.

Sowing was performed with four seeds per hole, spacing of 0.80 m between rows and 0.25 m between plants, resulting in twenty holes per row. Thinning was performed leaving two plants per hole and resulting in a population of 100,000 plants ha^{-1}.

Irrigation was performed using micro-sprinklers in Pentecoste and conventional sprinklers in Marco, with flow rate of 14.5 mm h^{-1} in both sites. In Pentecoste, irrigation was distributed three times a week for two hours, and in Marco, daily for thirty minutes.

Pods were harvested when reaching the optimal harvest point, that is, when grains showed 60 to 70% moisture, photosynthate accumulation ceased, and natural dehydration started. Harvest was performed manually, following the specific maturation pattern of each genotype.

After harvest, genotypes were evaluated for pod mass (PM), grain mass (GM), and mass of hundred grains (M100G), estimated on a precision scale; grain index (GI), corresponding to the ratio between grain mass and the mass of unthreshed pods; pod yield (PY), and grain yield (GY). Variables PM, GM, M100G, and GI were estimated based on a sample of ten fresh pods randomly selected from the plots. Estimation of pod and grain yields was expressed in kg ha^{-1} as the yield per plant of the assessed area of each plot.

To standardize pod weight in the harvest, the moisture of newly harvested pods and grains was corrected according to the methodology of Andrade et al. (2010). Samples of ten fresh pods from each genotype were weighed, obtaining fresh pod mass (fPM) and fresh grain mass (fGM), and soaked in water. Every thirty minutes, a sample was weighed until reaching constant mass, after which all samples were weighed and wet mass values were obtained. Afterwards, the following characters were calculated: mass of moistened pods (mPM) and mass of moistened grains (mGM).

The original characters were corrected based on these additional variables obtaining corrected pod yield (cPY), corrected grain yield (cGY), corrected grain index (cGI), corrected pod mass (cPM), corrected grain mass (cGM), and corrected mass of hundred grains (cM100G), according to the following equations:

$$cPY = fPY \times [mPM \div fPM] \quad (1)$$

$$cGY = fGY \times [mGM \div fGM] \quad (2)$$

$$cGI = cGY \div cPY \quad (3)$$

$$cPM = fPM \times [mPM \div fPM] \quad (4)$$

$$cGM = fGM \times [mGM \div fGM] \quad (5)$$

$$cM100G = fM100G \times [mGM \div fGM] \quad (6)$$

Subsequently, samples were packed in paper bags and placed in a forced air circulation oven at 80 ºC for 24 hours (Nakagawa, 1999), enough to reach constant mass, and the dry mass of all samples was obtained.

To verify the need to correct the obtained data, Pearson's correlation was performed between characters expressed in form of dry and fresh mass and dry and corrected mass.

Individual analysis of variance was performed for original and corrected data to check for differences between genotypes. Genotype means were grouped by Scott-Knott test at 5% probability. Individual analysis was performed according to the following statistical model:

$$Y_{ij} = \mu + G_i + B_j + \varepsilon_{ij} \quad (7)$$

Wherein Y_{ij} is the observed value of genotype i in block j; μ corresponds to the overall mean; G_i is the effect of the i^{th} genotype; B_j is the effect of the j^{th} block; and ε_{ij} corresponds to the random error associated with the model, with $\varepsilon_{ij} \sim NID(0, \sigma^2)$.

The analysis of combined variance was performed for corrected and uncorrected data to detect the interaction effect between genotypes and environments. For effect of analysis of combined variance, the effect of genotypes was considered fixed and the effect of environments, random. The statistical model represented by equation 8 was used:

$$Y_{ijk} = \mu + G_i + E_j + GE_{ij} + \varepsilon_{ijk} \quad (8)$$

Wherein Y_{ijk} is the observed value of genotype i in environment j and block k; μ is the overall mean; G_i is the effect of genotype i; E_j is the effect of environment j; GE_{ij} is the effect of the interaction of genotype i with environment j; and ε_{ij} corresponds to the experimental error associated with the ijk plot.

All statistical analyses were performed using the GENES – software package for analysis in experimental statistics and quantitative genetics (Cruz, 2013).

Results and discussion

Significant differences were observed between genotypes ($p < 0.01$), both in Pentecoste and Marco, for all variables without correction (original data) (Table 2). Different behaviors between genotypes were also verified for corrected characters, although only for the municipality of Pentecoste. For the municipality of Marco, genotypes did not differ for M100G. In relation to the other variables, difference was significant at probability levels of 1% (PM, GI, and PY) and 5% (GM and GY). These results showed difference between genotypes and that moisture correction may have reduced the sensitivity of the analysis of variance to detect this variability.

Table 2 - Summary of individual analysis of variance for the characters PM (Pod mass), GM (Grain mass), M100G (Mass of hundred grains), GI (Grain index), PY (Pod yield) and GY (Grain yield) of 16 cowpea genotypes evaluated for the production of green beans.

SV	DF	Mean Squares					
		PM (g)	GM (g)	M100G (g)	GI (%)	PY (kg ha^{-1})	GY (kg ha^{-1})
		Pentecoste - Original Data					
Genotypes	15	17.72**	1.99**	91.61**	365.96**	3,322,048.57**	1,243,718.47**
Mean		9.42	5.57	36.88	61.24	2,878.88	1,591.91
CV (%)		12.72	10.57	7.97	10.60	26.84	28.51
		Pentecoste - Corrected Data					
Genotypes	15	15.31**	2.91**	140.79**	267.94**	4,769,668.36**	1,521,028.74**
Mean		10.92	6.18	40.98	58.06	3,360.55	1,761.83
CV (%)		13.13	11.87	10.71	11.76	28.61	29.09
		Marco - Original Data					
Genotypes	15	11.84**	2.17**	55.46**	312.42**	484,521.28*	283,869.00**
Mean		9.02	4.94	41.91	55.93	2,308.97	1,300.19
CV (%)		11.06	11.87	11.16	8.45	20.92	21.04
		Marco - Corrected Data					
Genotypes	15	12.28**	1.98*	85.51^{ns}	332.23**	507,279.28**	192,493.95*
Mean		9.94	5.73	48.82	58.89	2,535.83	1,489.09
CV (%)		11.47	16.95	16.06	15.08	22.76	24.40

Source of Variation (SV); Degrees of Freedom (DF); Coefficient of Variation (CV); ^{ns} Not significant; **,* Significant at 1 and 5% probability, respectively, by the F test.

The coefficients of variation (CV) showed greater amplitude for data evaluated in Pentecoste, ranging from 7.97 (M100G) to 29.09% (GY). For the municipality of Marco, the CV ranged from 8.45 (GI) to 24.40% (GY). CV values obtained in this study corroborate with ranges observed in other studies with cowpea for production of green grains (Silva et al., 2013; Torres Filho et al., 2017; Souza et al., 2019), demonstrating good experimental precision and reliability of estimates. It is highlighted that estimates of coefficients of variation for the original data were lower than those verified for the corrected data, showing that moisture correction reduced experimental precision.

According to the analysis of combined variance, significant differences were observed for most of the characters regarding the effect of genotypes, environments, and interaction of genotype x environment (Table 3). It was also found that, like individual analysis, combined analysis showed less discriminative capacity for corrected characters. Thus, genotype means for each variable will be discussed based on uncorrected data. The Scott-Knott test was not applied, since there was no significant difference between genotypes for M100G.

Table 3 - Summary of joint analysis of variance for the characters PM (Pod mass), GM (Grain mass), M100G (Mass of hundred grains), GI (Grain index), PY (Pod yield) and GY (Grain yield) of 16 cowpea genotypes evaluated for the production of green beans.

SV	DF	Mean Squares					
		PM (g)	GM (g)	M100G (g)	GI (%)	PY (kg ha^{-1})	GY (kg ha^{-1})
		Original Data					
Genotypes (G)	15	26.75**	3.53**	86.03^{ns}	626.03**	2,155,524.24*	838,627.80*
Environments (E)	1	4.90^{ns}	12.81**	810.13**	904.40**	10,393,722.23**	2,723,258.71**
G x E	15	2.81*	0.63^{ns}	61.03**	52.35^{ns}	1,651,045.61**	688,960.58**
Residue	96	1.44	0.37	15.35	34.00	411,555.84	139,116.31
		Corrected Data					
Genotypes (G)	15	23.75**	3.48*	98.44^{ns}	489.56**	2,745,093.72*	912,870.97*
Environments (E)	1	30.56**	6.41**	1,964.94**	22.11^{ns}	21,765,507.16**	2,380,458.36**
G x E	15	3.84*	1.41*	127.86**	110.62^{ns}	2,531,853.92**	800,651.73**
Residue	96	2.03	0.76	39.77	64.33	551,774.87	170,082.14

Source of Variation (SV); Degrees of Freedom (DF); ^{ns} Not significant; **,* Significant at 1 and 5% probability, respectively, by the F test.

The PM ranged from 6.65 (Vagem Roxa-THE) to 14.32 g (Azulão-MS), with overall mean of 9.22 g (Table 4). Besides cultivar Azulão-MS, three genotypes stood out regarding pod weight, namely: MNC00-303-09E (11.26 g), Sempre Verde-CE (10.93 g), and Paulistinha (10.73 g). Regarding the GM variable, the Scott-Knott test grouped genotypes into four groups (Table 4). The overall mean of treatments was 5.25 g, with amplitude ranging from 4.25 to 6.75 g. Cultivars Paulistinha and Sempre Verde-CE showed the highest values of this variable. These values exceed those found by Souza et al. (2019), who evaluated agronomic characteristics of twenty-three cowpea genotypes for production of green grains in the municipality of Mossoró, Rio Grande do Norte state, Brazil, and obtained mean pod and grain mass of 7.57 and 4.70 g, respectively.

Table 4 - General means of the variables PM (Pod mass), GM (Grain mass), M100G (Mass of hundred grains), GI (Grain index), PY (Pod yield) and GY (Grain yield) of 16 genotypes of cowpea evaluated for the production of green beans.

Genotypes	PM (g)	GM (g)	M100G (g)	GI (%)	PY (kg ha^{-1})	GY (kg ha^{-1})
MNC00-303-09E	11.26 b	4.25 d	38.03	38.59 e	2,435.17 c	1,018.24 c
MNC00-595F-2	9.36 c	5.04 c	35.11	54.01 d	2,223.33 d	1,185.25 c
MNC00-595F-27	8.36 d	5.16 c	35.07	61.68 b	2,789.88 c	1,562.75 b
MNC05-835B-15	8.76 c	4.67 d	36.99	53.19 d	2,672.77 c	1,233.57 c
MNC05-835B-16	9.20 c	4.65 d	36.07	51.80 d	2,414.64 c	1,177.74 c
MNC05-841B-49	7.95 d	5.03 c	40.14	63.29 b	2,664.65 c	1,548.48 b
MNC05-847B-123	8.16 d	5.16 c	39.96	63.29 b	2,376.15 c	1,302.57 c
MNC05-847B-126	8.46 d	4.79 d	38.17	57.08 c	2,971.56 b	1,637.92 b
MNC99-541F-15	8.37 d	5.51 c	44.12	66.05 a	2,045.97 d	1,405.62 b
BRS Guariba	7.77 d	5.34 c	43.05	68.62 a	2,425.82 c	1,503.27 b
BRS Tumucumaque	9.09 c	5.75 b	44.06	63.55 b	4,006.88 a	2,419.69 a
BRS Xiquexique	8.18 d	5.11 c	40.30	63.05 b	1,941.70 d	1,171.33 c
Paulistinha	10.73 b	6.75 a	40.78	63.67 b	2,719.51 c	1,546.38 b
Vagem Roxa-THE	6.65 e	4.60 d	34.29	69.38 a	1,892.28 d	1,270.18 c
Azulão-MS	14.32 a	5.96 b	41.12	41.91 e	3,159.98 b	1,479.15 b
Sempre Verde-CE	10.93 b	6.29 a	43.12	58.23 c	2,762.52 c	1,674.72 b
Average	9.22	5.25	39.40	58.59	2,593.93	1,446.05

Means followed by the same letter belong to the same group, using the Scott-Knott test, at 5% probability.

Although treatments did not differ for the M100G character (Table 3), the overall mean found for this variable was 39.40 g (Table 4), indicating that grains produced by all genotypes are within the standards of producers and consumers, who prefer grains weighing more than 20 g per hundred grains (Freire Filho, 2011).

The GI ranged from 38.59 to 69.38%, with overall mean of 58.59% (Table 4), higher than that found by Torres Filho et al. (2017), 52.56%, who evaluated the production of fresh grains of cowpea genotypes in the municipality of Mossoró. The grain index variable, corresponding to the ratio between grain mass and mass of unthreshed pods, is one of the most valuable characteristics for the green bean market. Therefore, the results obtained in this study indicate high efficiency of genotypes Vagem Roxa--THE, BRS Guariba, and MNC99 541F 15 in the allocation of photosynthates for grain production.

In the case of the PY variable, the formation of four groups of genotypes ($p<0.05$) was observed, with cultivar BRS Tumucumaque integrating the group with the highest pod yield (Table 4). Genotypes showed a mean of 2,593.93 kg ha^{-1}, with amplitude ranging from 1,892.28 to 4,006.88 kg ha^{-1}, results similar to those observed by Silva et al. (2013) in a study with cowpea for production of fresh grains in the conditions of Serra Talhada, Pernambuco state. On that occasion, the authors obtained a mean of 2,138.23 kg ha^{-1} and the best pod yield, as in the present study, was found for BRS Tumucumaque, with 3,677.63 kg ha^{-1}.

The grain yield of genotypes ranged from 1,018.24 to 2,419.69 kg ha^{-1} for MNC00-303-09E and BRS Tumucumaque, respectively (Table 4). Although below the crop potential, the yield average of 1,446.05 kg ha^{-1} was considered satisfactory since it surpasses the national yield average of 475 kg ha^{-1} (CONAB, 2020). Silva et al. (2013) and Torres Filho et al. (2017), who evaluated cowpea genotypes for the production of green grains in an irrigated system, found results similar to those of this study, with mean grain yield of 1,353.23 and 1,557.65 kg ha^{-1}, respectively. Pod and green grain yields are the most relevant characters in genotype selection (Andrade et al., 2010).

Regarding the simple correlation estimated between characters expressed in form of fresh, dry, and corrected mass, variation from -0.01 to 0.81 (Table 5) was observed. Pearson's correlation coefficient (r) measures the linear association between variables and ranges from -1.0 to 1.0. The sign indicates a negative or positive direction of the relationship and the value suggests the strength of the relationship between variables. However, extreme values (-1 and 1) are hardly found (Figueiredo Filho & Silva Júnior, 2009).

Table 5 - Pearson's correlation estimates between six characters, expressed in fresh, dry and corrected mass, evaluated in 16 cowpea genotypes for the production of green beans.

Characters	Correlations	
	Pentecoste	Marco
fPM x dPM	0.43^{ns}	0.57*
cPM x dPM	0.53**	0.62*
fGM x dGM	0.76**	0.54*
cGM x dGM	0.72**	0.37^{ns}
fM100G x dM100G	0.51*	0.55^{ns}
cM100G x dM100G	0.48^{ns}	0.31^{ns}
fGI x dGI	0.81**	0.63**
cGI x dGI	0.76**	0.17^{ns}
fPY x dPY	0.37^{ns}	0.04^{ns}
cPY x dPY	0.42^{ns}	0.14^{ns}
fGY x dGY	0.32^{ns}	0.13^{ns}
cGY x dGY	0.31^{ns}	-0.01^{ns}

Fresh pod mass (fPM), dried (dPM) and corrected (cPM); Fresh grain mass (fGM), dried (dGM) and corrected (cGM); Fresh mass of hundred grains (fM100G), dried (dM100G) and corrected (cM100G); Fresh grain index (fGI), dried (dGI) and corrected (cGI); Fresh pod yield (fPY), dried (dPY) and corrected (cPY); Fresh grain yield (fGY), dried (dGY) and corrected (cGY). ^{ns} Not significant; **,* Significant at 1 and 5% probability, respectively, by the F test.

In this study, the relevance of correlation consists of verifying the need for moisture correction, which according to Andrade et al. (2010), occurs due to differences in the moisture of pods at harvest. Thus, the data must be corrected if the magnitude of simple correlation is greater between dry and corrected mass values, since it represents more safely the dry mass accumulated by genotypes. On the other hand, if the magnitude of simple correlation is greater between dry and fresh mass values, data correction is unnecessary.

In the conditions of Pentecoste, by analyzing the correlation coefficients established between variables, a degree of relationship (r) between fPM and dPM equal to 0.43 was verified with no significance. For cPM and dPM, the correlation was of 0.53, significant at 1% probability. All other variables were positively correlated with low to medium magnitude. The same behavior of positive correlations of low/medium magnitude was observed for characters evaluated in the municipality of Marco, with emphasis on the correlation between fGI and dGI variables, 0.63 ($p<0.01$).

In general analysis, most variables were positively correlated with each other, except between cGY and dGY, negatively correlated (-0.01). It was also found that correlations of greater magnitude were established between values of fresh and dry mass. Therefore, moisture corrections of pods and grains are unnecessary for the environments evaluated, since uncorrected data, besides showing higher correlation coefficients with dry mass values, also showed lower coefficients of variation than corrected data, demonstrating greater representativeness of data.

Studies suggest the harvesting of green cowpea with moisture ranging from 60 to 70%, when beans are close to physiological maturity (Sousa et al., 2015), which is commonly performed by producers. The results of this study corroborate this practice, as moisture correction was proven unnecessary for cowpea production in the regions evaluated.

Conclusion

The original mass of pods and green grains provided greater representation of the dry mass of genotypes in relation to the corrected data. Therefore, the moisture correction of cowpea grains and pods is unnecessary in the conditions evaluated for a correct estimation of yield.

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