

Evaluation of Seed Protein Content in Cowpea

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Introduction

- Cowpea [*Vigna unguiculata* (L.) Walp.] ($2n=2x=22$) is a versatile leguminous crop.



Diversity of cowpea genotypes
(Photo credit: Dr. Ainong Shi)

- Cowpea used for human consumption and a supplement fodder to cereal for livestock (Pedalino et al., 1990)
- Affordable source of protein and constituted supplement fodder for animal (Singh et al., 2003).
- Good functional properties of cowpea protein provide plant protein source for people who are suffering allergy from soybean protein.
- Objective: to evaluate the protein content in 11 advanced cowpea lines of the University of Arkansas, Fayetteville.

Materials and Methods

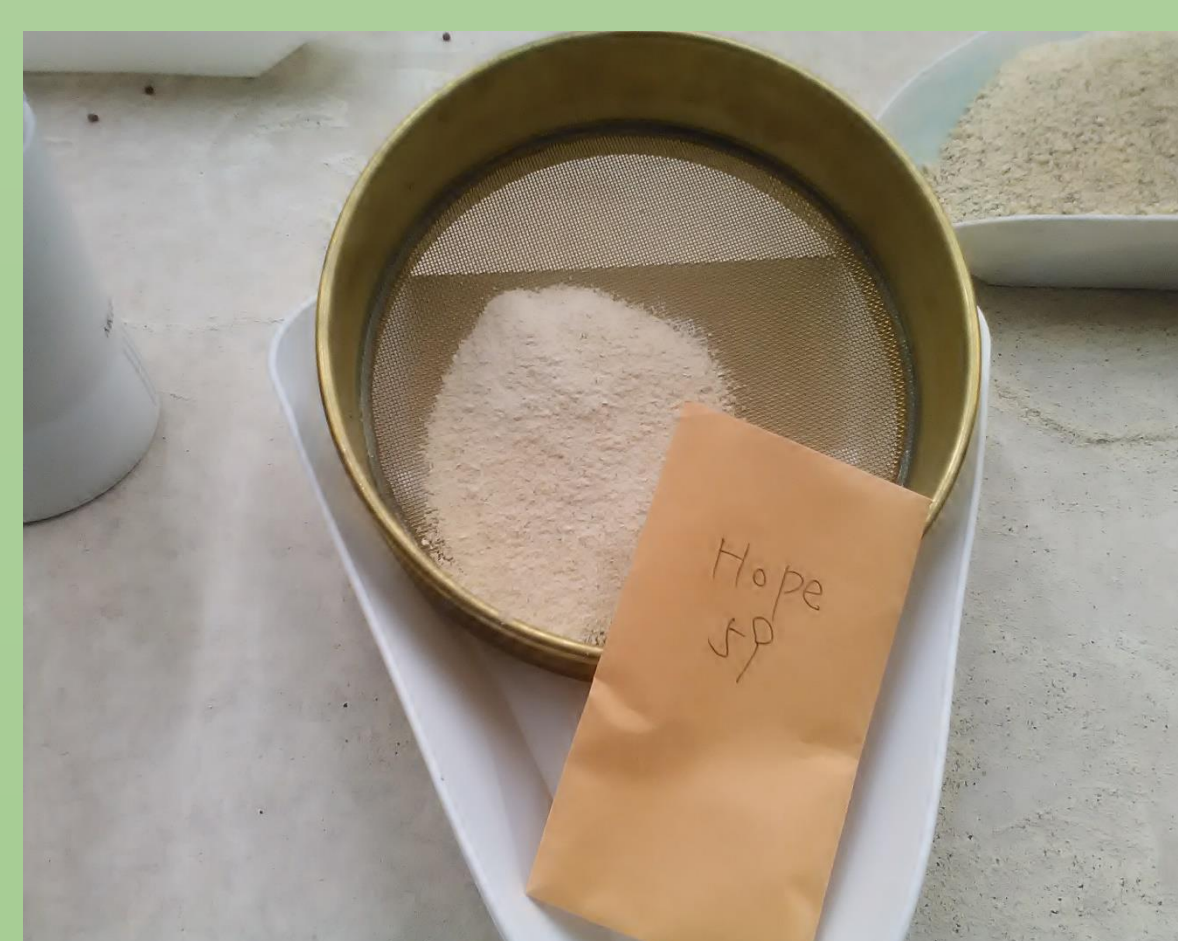
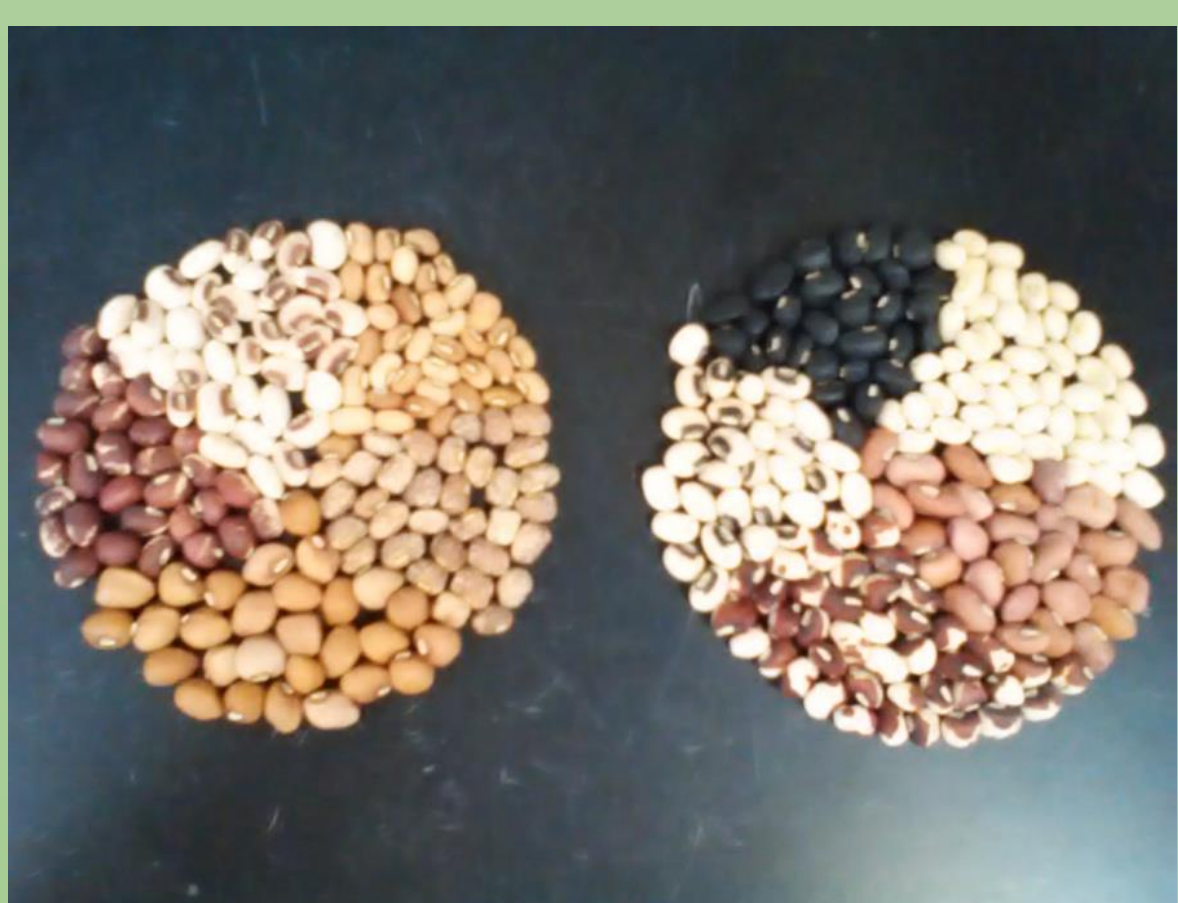
Plant materials: 11 advanced cowpea lines of the University of Arkansas, Fayetteville (01—1781, 07—303, 09—204, 09—208, 09—393, 09—655, 09—714, 09—741, AR Blackeye #1, Early Scarlet, and Ebony).



Field experiment: investigations conducted in three locations (Alma, Fayetteville, and Hope) in an RCBD with two blocks in each location



Seed preparation



Use of Elementar Rapid N III by nitrogen combustion for protein analysis



Protein content = $6.25 \times \%N$ ((Moore et al. 2010)



Statistical analysis: JMP Genomics 7 (SAS Institute, Cary, NC) for ANOVA, and Student T-test used for the mean separation

Results

- Seed protein content averaged 25.4% with ranged from 21.2% to 29.0%, and had a standard deviation (Std) of 1.94% with 0.24% Std Error.

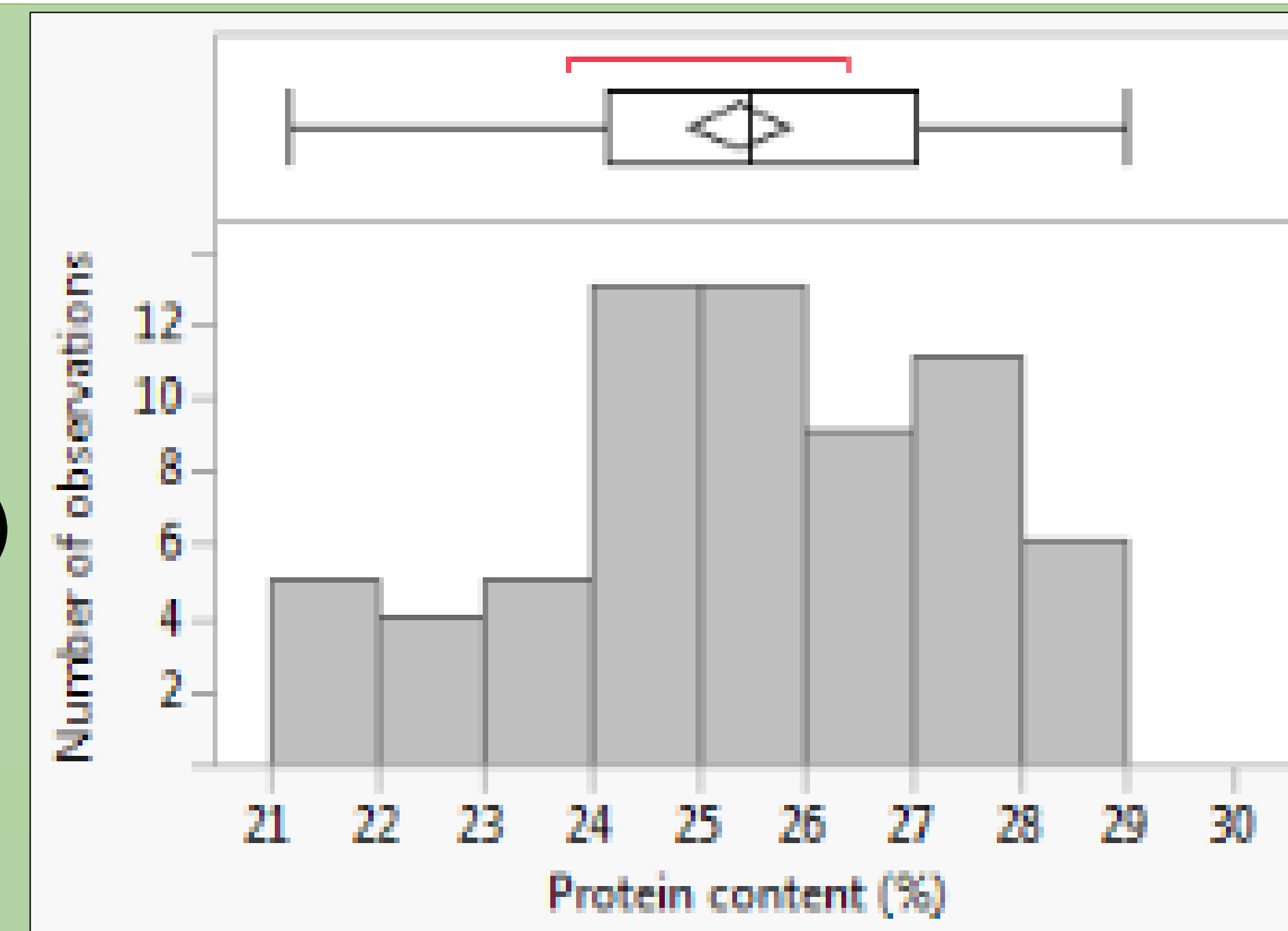


Figure 1. Distribution of the total seed protein content

Table 1. ANOVA for the total seed protein content among the eleven cowpea genotypes

Source	DF	Sum of Squares	Mean Squares	F Ratio	Prob > F
Location	2	90.75	45.38	62.2753	<.0001
Genotype	10	72.11	7.21	9.897	<.0001
Genotype*Location	20	60.73	3.04	4.1674	0.0002
Error	30	21.86	0.73	--	--

Table 2. Mean separation for the 11 cowpea lines

Cowpea Genotype	LSMean protein content	Significant at P=0.05
Early Scarlet	27.4	A
09-204	26.9	A
01-1781	25.9	B
09-393	25.9	BC
09-208	25.6	BCD
07-303	25.2	BCD
AR Blackeye #1	24.9	CDE
09-714	24.9	DE
Ebony	24.9	DE
09-655	24.0	EF
09-741	23.7	F

Table 2. Mean separation for the 11 cowpea lines

Location	LSMean protein content	Significant at P=0.05
Alma	26.6	A
Hope	25.8	B
Fayetteville	23.8	C

- Significant differences were observed among location, genotype, and the interaction of genotype x location
- High protein content: "Early Scarlet" (27.4%) and "09-204" (26.9%)

References

- Pedalino, M., M. Paino D'Urzo, A. Costa, S. Grillo, R. Rao, N.Q. Ng, and L.M. Monti. 1990. "Biochemical Characterization of Cowpea Seed Proteins." In *Cowpea Genetic Resources*, 81–89. IITA.
- Singh, B.B, H.A Ajeigbe, S.A Tarawali, S Fernandez-Rivera, and Musa Abubakar. 2003. "Improving the Production and Utilization of Cowpea as Food and Fodder." *Field Crops Research* 84 (1-2): 169–77.