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Carmen Jacinto-Hernández

Laboratorio de Calidad de Frijol, carmenjh9@yahoo.com

Ramón Garza-García

Universidad Autónoma de Tamaulipas

Dagoberto Garza- García

Programa de Frijol

Irma Bernal-Lugo

Ciudad Universitaria

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DARKENING OF THE SEED COAT IN DRY BEAN GENOTYPES DURING EARLY DAYS AFTER HARVEST

Carmen Jacinto-Hernández¹, Ramón Garza-García², Dagoberto Garza- García³ Irma Bernal-Lugo⁴

¹Laboratorio de Calidad de Frijol y ²Univ. Autónoma de Tamaulipas ³Programa de Frijol, Campo Experimental Valle de México-INIFAP. A. P. 10, Chapingo, Estado de México. e-mail: carmenjh9@yahoo.com ⁴Facultad de Química-UNAM. Ciudad Universitaria, UNAM. México,D.F.

INTRODUCTION

As it is a center of origin of dry beans (*Phaseolus vulgaris* L.), in Mexico there are a wide variety of colors and shapes that are consumed. Post harvest, darkening of the seed coat is a problem in light colored beans, which decreases its marketability. In the lab, coat color is evaluated by reflectance spectrophotometry and it is used as a parameter for selection in genetic improvement. Although this trait exhibits a clear genotype-environment interaction, it is possible to select genotypes with greater color stability during storage, which is associated with increased in shelf life. In previous studies (Jacinto *et al.* 2006, 2007) polyphenol oxidase activity has been associated with the proneness of genotypes to darkening during storage. To select genotypes less prone to darkening of seed coat, accelerated aging is induced in the beans by increasing the temperature and relative humidity, this process implies time and work. The objective of this study was to assess the tendency of a group of eleven genotypes to darken during the first 44 days after harvesting.

MATERIALS AND METHODS

During PV 2014, eleven dry bean genotypes were sown at Santa Lucía de Prías, Texcoco, estado de México. The experimental plot was one 4 m- long row. Except for one black seed coat variety, the other 10 genotypes were light colored either with pattern or one single color. Upon reaching maturity, the plants of each plot were hand threshed. The first day after threshing color was measured using a CM-5 spectrophotometer (Konica Minolta, Inc., Osaka, Japan). Color reflectance was recorded in the CIE Lab color coordinate system, with D65 Illuminant and 10° observer. Samples were then left at room temperature in glass cases for 44 days. During 28 days color measurements every two to three days were taken; then it was measured at 44 days. Data was processed through an analysis of variance and a correlation test.

RESULTS AND DISCUSSION

Genotypes exhibited significant differences in color variables L*, a*, and b* ($P \leq 0.01$). With the passing of the days, genotypes of clear coat darkened. The L* value decreased in those with clear coat, and increased in the black: Negro Perla. After 44 days, the diminishing in L* value compared to its control (0 days after harvesting), was up to -6.7 units. Data of six improved varieties are shown on figure 1. Genotypes increased in different magnitude of reddish tones (maximum $\Delta a^* = 2.9$ units) while the b* variable had a tendency to decrease. In general the color change was associated with an increase in the reddish colors in light colored beans and in some cases, as Flor de Mayo, also yellowish tones increased; while in yellow beans intensity of yellow decreased. In Negro Perla the more days the less red (a*) tones and slightly increased blue (b*) Within the light colored varieties Pinto Saltillo and Bayo Azteca showed low proneness to darken. While Flor de Mayo M-38, Flor de Durazno and Bayomex showed higher level of darkening. Two accessions of native bean called vaquita-rojo (V. rojo) and vaquita negra (V. negra) (figure 2) were distinguished for minimum color change. By comparing the color (L*) of

the eleven genotypes 7, 15 and 44 days after harvest, correlations between L* (7 days AH) and L* (15 days AH) were detected $r=0.92$. While L* (15 days AH) and L* (44 days AH) $r=0.91$. Between L* (7 days AH) and L* (44 days AH) $r=0.84$

CONCLUSION

The results suggest that the reflectance spectrophotometry may be used in the early days after harvest to select the genotypes less prone to postharvest darkening without performing accelerated aging tests.

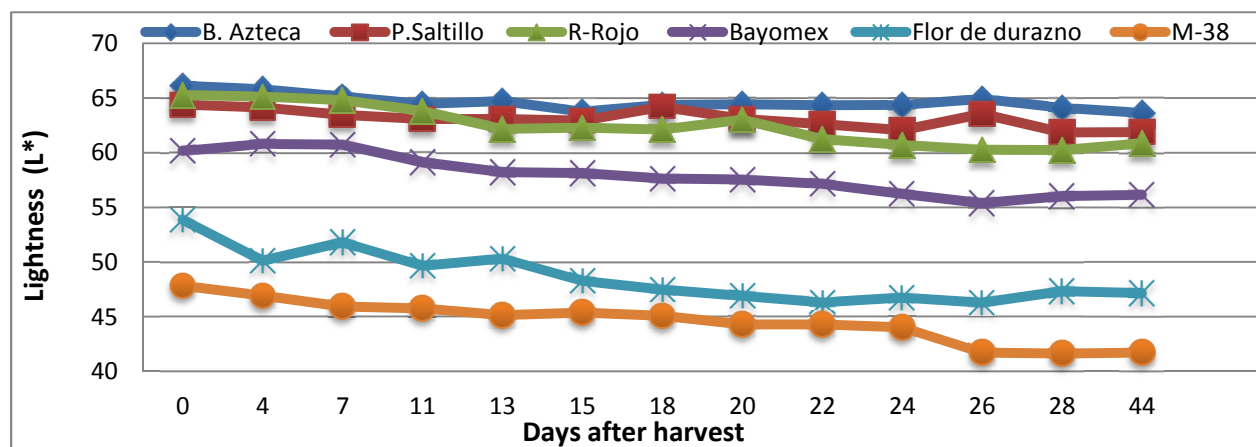


Figure 1. Color changes of the seed coat of 6 improved varieties of *Phaseolus vulgaris* L. measured during 44 days at room temperature after harvest

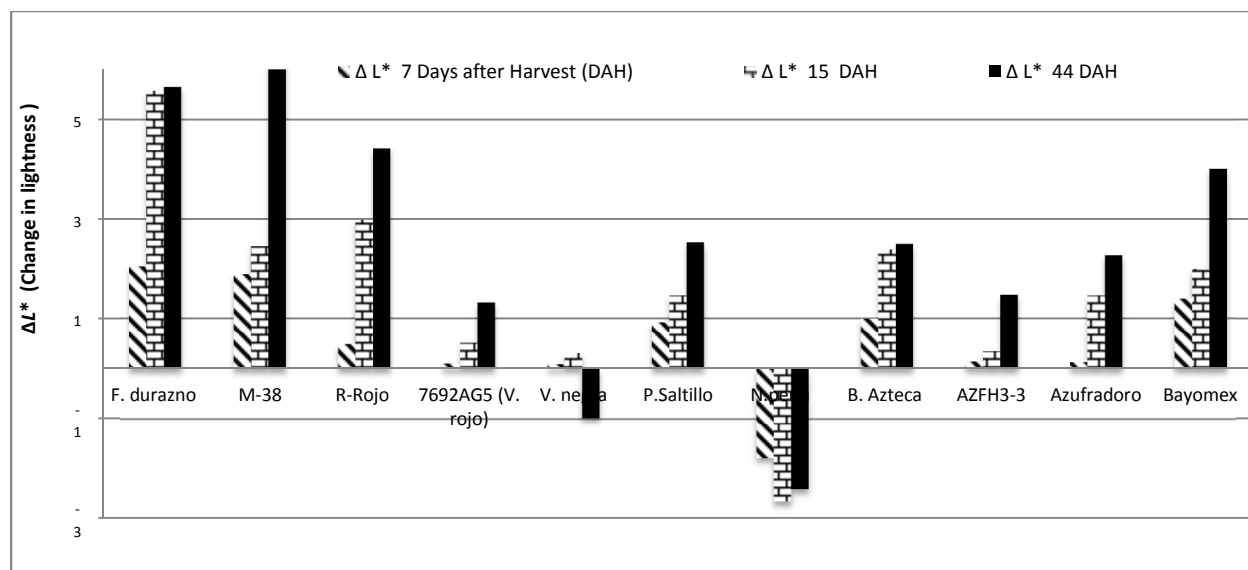


Figure 2. Change in lightness (ΔL^*) of seed coat color of 11 improved and native varieties of *Phaseolus vulgaris* L.

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