

The Selection of Dry Bean Cultivars by Potato Leafhoppers Based on Visual Cues

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²Department of Environmental Biology, University of Guelph, Guelph ON Canada. **Introduction**

The potato leafhopper (PLH) is a serious pest of dry beans in Ontario, reducing yield by up to 60% (OMAF 2001). PLH preferentially select some cultivars over others (Wylde 1999). Recent findings suggest that foraging PLH primarily discriminate between hosts using visual stimuli (Todd et al. 1990), with wavelength-specific colour preference and reflectance intensity of host leaves having the greatest influence (Lapis and Borden 1995). PLH are preferentially attracted to green and yellow, with spectral reflectance values ranging from 520 to 580 nm, typical of the abaxial surface of host leaves (Chu et al. 2000).

Materials and Methods

Laboratory studies were conducted at Ridgetown College on three dry bean cultivars, to determine the preferential selection of the following cultivars by adult PLH based on leaf colour.

- 1) Berna brown - medium size brown seed, very attractive to PLH but little commercial value
- 2) Stingray white - small, white seeded, moderately attractive to PLH, a commercial cultivar
- 3) EMP 419 – small, white seeded, an experimental PLH tolerant cultivar

Intact leaves of each cultivar were placed under circular holes cut in black bristol board, to provide uniform sized leaflets. A black card was used as a control. A Plexiglas® chamber was placed over this arrangement, and 50 adult PLH were released through a sleeved hole in the top corner of the chamber, to ensure they selected leaves from an aerial position. A choice was recorded when an adult landed on a leaflet. Video equipment was assembled to observe the experiment at a distance, and to record the events.

In a second experiment, a spectroradiometer was used to quantify the wavelength reflectance values of 20 leaflets of each cultivar. For each measurement, the apparatus was referenced to a standard, and then re-configured for the sample. A percent reflectance value was obtained as a ratio (sample/ reference) at 2 nm increments from 400 to 800 nm.

Results and Discussion

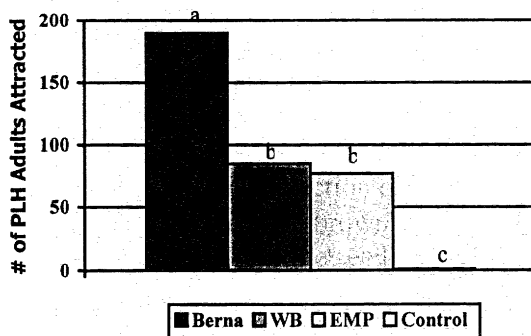


Fig. 1. Leaf choices by adult PLH in a Plexiglas® chamber. Bars with the same letter are not significantly different ($P > 0.05$, Tukey's HSD).

1) Adult PLH preferred Berna leaves two to one, compared to Stingray and EMP 419 leaves under controlled lab feeding studies (see Fig.1). The PLH adults were not attracted to the control. Once a choice was made, all PLH remained on the selected leaf for the duration of a 2 hour trial.

- 2) The greatest differences between cultivars in wavelength reflectance from 400 to 800 nm occurred at 446, 488, 546, 556, 648, 676, 748 and 772 nm.
- 3) Berna leaves had significantly higher reflectance values at 556 nm, in the true green region of the spectrum. This agrees with other studies (Chu et al., 2000) where colour card traps were used.
- 4) Analysis in the red region of the spectrum showed that EMP 419 had the highest reflectance values, which may explain part of its tolerance to PLH feeding.
- 5) Leaf reflectance may hold some promise to screen for PLH resistance in edible beans, as this analysis can be done nondestructively in the field. In order for this to be truly effective, a more intense examination, using several cultivars at each level of resistance is necessary.
- 6) Dry bean cultivars that are preferred by adult PLH, based on leaf colour, may be utilized as a trap-crop, if they provide sufficient attraction during the period of pest colonization, and these cultivars have commercial appeal

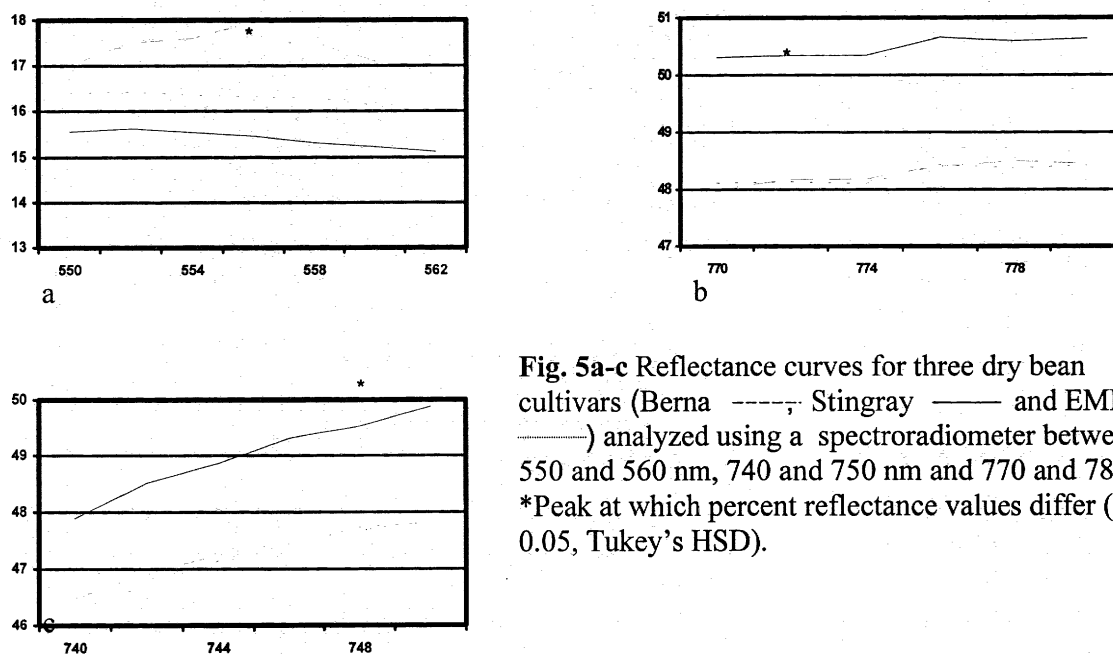


Fig. 5a-c Reflectance curves for three dry bean cultivars (Berna ----; Stingray — and EMP419 ·····) analyzed using a spectroradiometer between 550 and 560 nm, 740 and 750 nm and 770 and 780 nm. *Peak at which percent reflectance values differ ($P < 0.05$, Tukey's HSD).

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