



# Cultivation and Nutrition of Vegetable Soybeans

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## Introduction

Edamame is a vegetable type soybean (*Glycine max* L. Merrill.) harvested and consumed at the R6 state of maturity. Edamame's gain in popularity has been attributed to the nutritional content and potential health benefits due to antioxidants and phytohormones. An understanding of the nutritional ingredients and potential yield of commercially available cultivars can help growers make production decisions and educate consumers about the health benefits of edamame.

## Objectives

Evaluate 5 commercial edamame cultivars for:  
 •Yield  
 •Edamame quality characteristics  
 •nutritional ingredients

## Methods

- Cultivars: Midori Giant (MG), Sunrise (SR), Besweet 292 (BS292), BeSweet 2015 (BS2015), BeSweet 2001 (BS2001).
- Four-row plots with four replications.
- Marketable and unmarketable pods were measured and 100 seed weight was taken.
- AOAC methods were used to measure lipids, protein, and ash.
- Carbohydrate content was obtained using the following equation [CHO=100-% moisture - % lipids - % protein - % ash].
- Antioxidants measured using DPPH quench and oxygen radical absorbing capacity (ORAC) (Chung 2008).
- Isoflavones were extracted and analyzed using HPLC (Chung 2008).

## Results

**Table 1. Yield and Edamame Characteristics**

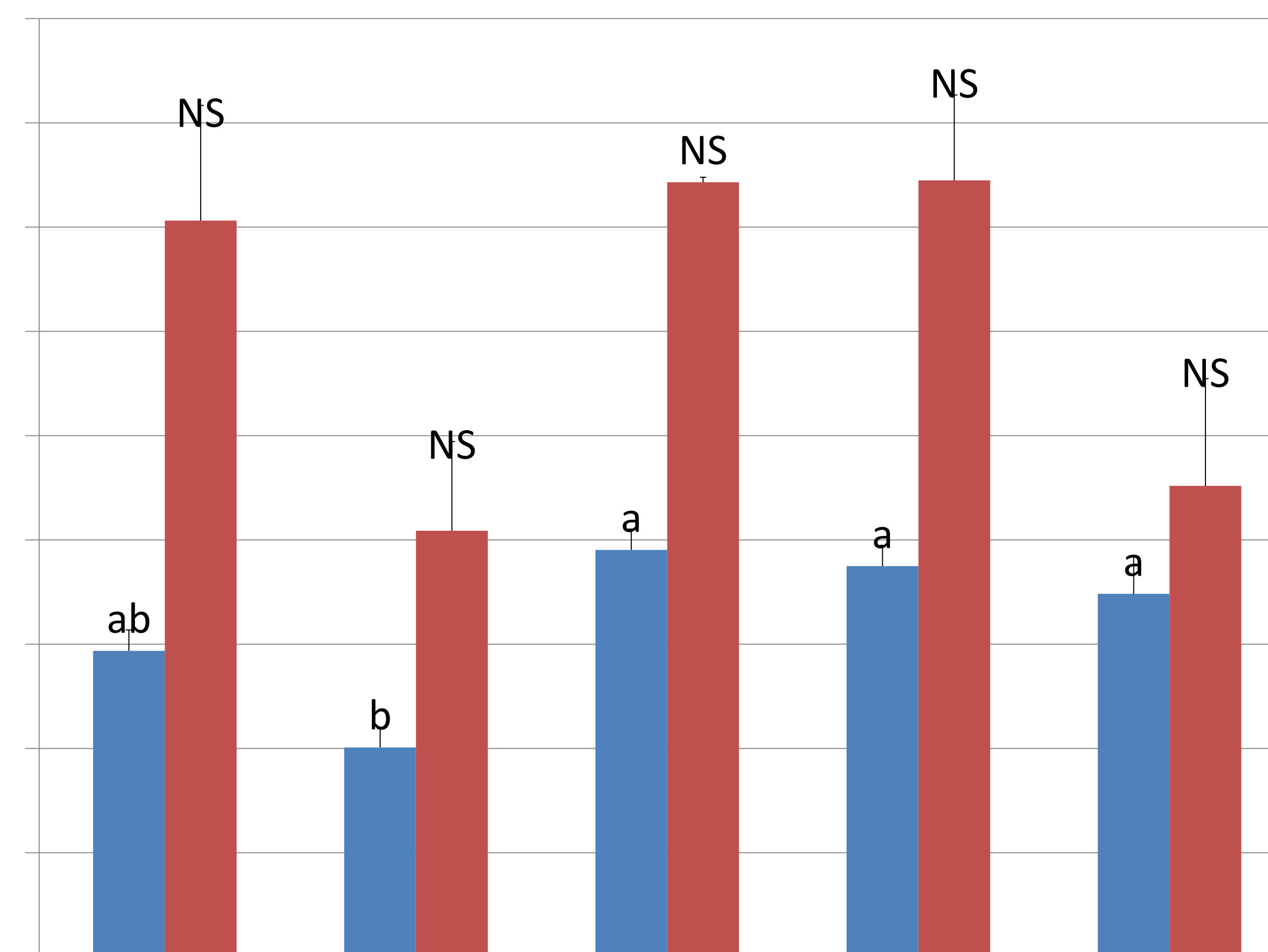
Cultivar	Total Wt (kg ha <sup>-1</sup> ) <sup>z</sup>	100 Seed Wt (g)	% Marketable Pods <sup>y</sup>
BS292	9855 <sup>a</sup>	62.4 <sup>b</sup>	81.4 <sup>b</sup>
MG	8928 <sup>ab</sup>	66.2 <sup>ab</sup>	85.6 <sup>ab</sup>
SR	7660 <sup>ab</sup>	71.0 <sup>a</sup>	91.3 <sup>a</sup>
BS2001	7123 <sup>ab</sup>	61.3 <sup>b</sup>	79.0 <sup>b</sup>
BS2015	5708 <sup>b</sup>	50.1 <sup>c</sup>	84.1 <sup>ab</sup>

<sup>z</sup> Yield estimates are based on plant populations of 143445 plants per hectare

<sup>y</sup> Marketable pods is the percent of pods with two or more beans pod<sup>-1</sup>

Levels not connected by the same letter are significantly different

- 'BS292' had the highest total yield, but was significantly different from only 'BS2015'.
- SR had a significantly higher % marketable pods than 'BS292' and 'BS2015'.
- SR had a significantly larger seed size than all but MG.



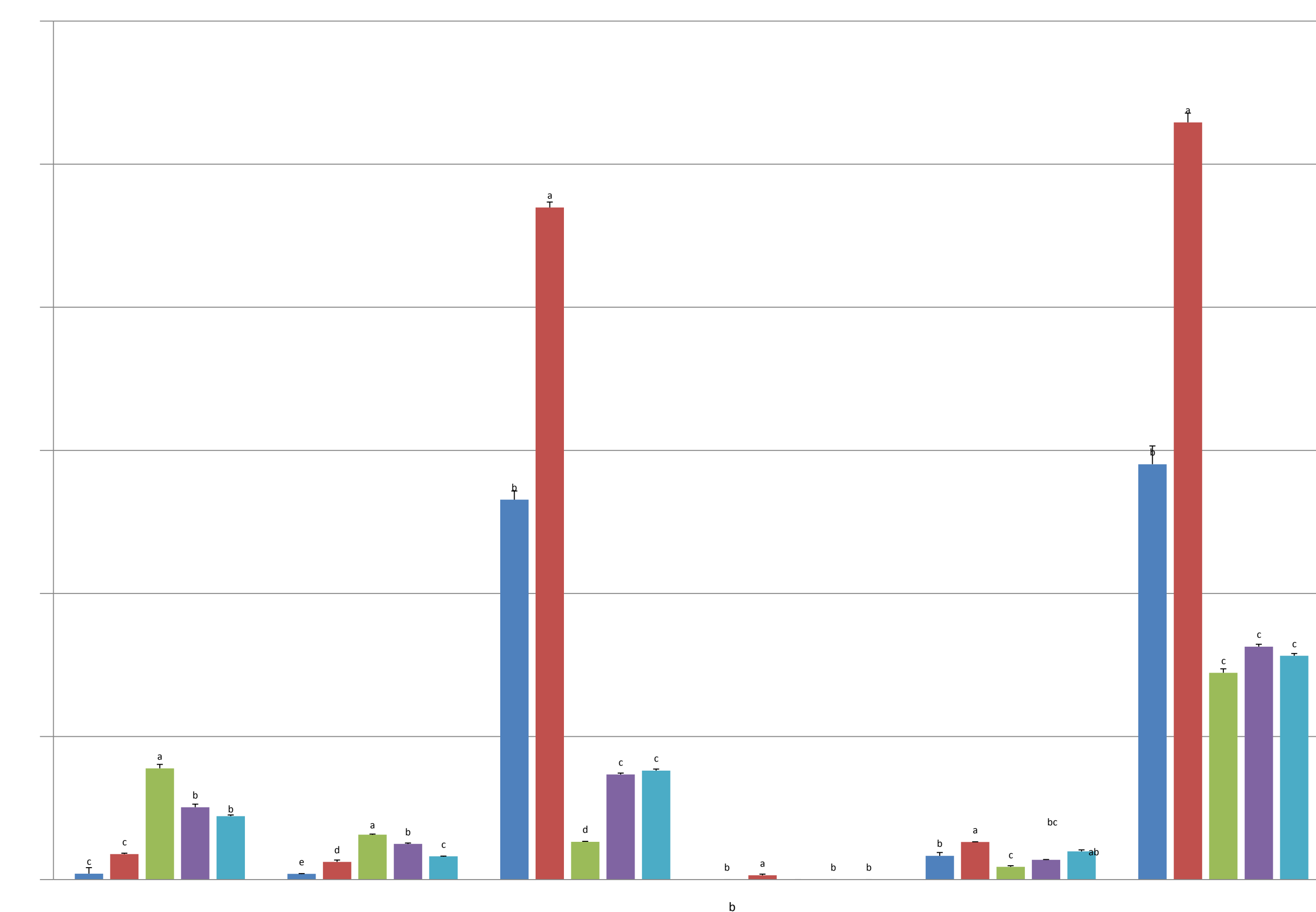
- No significant differences in the ORAC assay.
- 'SR' and 'BS2015' had the highest antioxidant capacities in both assays.
- 'Midori Giant' had significantly less quenching power in the DPPH assay than all others and the lowest absorbing capacity in ORAC assay.

**Table 2. Nutritional Ingredients**

Cultivar	Lipid <sup>z</sup>	Protein <sup>z</sup>	Ash <sup>z</sup>	CHO
BS292	16.3 <sup>b</sup>	36.1 <sup>b</sup>	5.3 <sup>a</sup>	13.6
MG	17.7 <sup>a</sup>	36.5 <sup>ab</sup>	5.3 <sup>a</sup>	13.2
SR	18.3 <sup>a</sup>	36.3 <sup>ab</sup>	5.1 <sup>a</sup>	11.5
BS2015	14.0 <sup>c</sup>	37.6 <sup>ab</sup>	5.3 <sup>a</sup>	10.0
BS2001	14.5 <sup>c</sup>	38.3 <sup>a</sup>	5.3 <sup>a</sup>	12.4

<sup>z</sup> Means calculated using two replications

- Lipid and protein contents were negatively correlated  $r = -0.71$ .
- Only 'BS2001' and 'BS292' had significant differences in protein content.



- Malonyl genistin had the highest concentrations of all isoflavones measured.
- Interestingly, 'Midori Giant' had the highest concentration of total isoflavones but the lowest anti-oxidative properties.

## Conclusion

- Edamame has potential as an alternative crop in Virginia.
- There were significant variations in yield, total antioxidants, and isoflavones among edamame cultivars.
- Data from the second year of this study is being collected and analyzed.

## References

AOAC International. 1995. *Official methods of analysis of AOAC International*. Arlington, VA: AOAC International

Chung, H. et al. 2008. *Characterization and Comparison of Antioxidant Properties and Bioactive Components of Virginia Grown Soybeans*. J. Agric. Food Chem. 56: 11515-11519.