

# Nutritional and Physical Contents of Organic Sweet Potatoes (*Ipomoea batatas* [L.] Lam) Treated with Organic Pesticides

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## ABSTRACT

Organic food production has several potential and documented health benefits. Orange fleshed sweet potato is a rich source of β-carotene which is a precursor of vitamin A. Three sweetpotato cultivars (Covington, Garnet, and Orleans) treated with three organic pesticides (Azadirachtin, Pyrethrin, Spinosad) were evaluated for nutritional (protein, vitamin C, crude fiber, β-carotene, moisture) and physical contents (color, texture) using the Bradford, 2,6- Dichlorophenol indophenol dye, AOAC, Spectrophotometric, conventional oven, Minolta chroma-meter and Instron testing system, respectively. Covington, Orleans and Garnet had mean protein contents of 11.8 ± 0.9, 10.2 ± 0.3 and 8.3 ± 0.3 mg/g, respectively. Covington cultivars control and that treated with Spinosad pesticide had similar protein contents (11.12± 0.09 vs 10.8± 0.09 mg/g). The Covington cultivar treated with Pyrethrin pesticide had the highest mean protein content of 12.89± 0.09 mg/g, which was significantly (P<0.05) higher than all the other Covington cultivars treated with organic pesticides. Garnet cultivar treated with the Spinosad pesticide had significantly (P<0.05) higher β-carotene content than Garnet cultivar control (62.61± 2.7 vs 45.47± 2.7 mg/100g). Orleans cultivar treated with Spinosad and with Azadirachtin pesticides had similar b values (43± 1.1 vs 42.1± 1.1). For the Orleans cultivar, the control had the highest mean b value of 47.8± 1.1, which was significantly (P<0.05) higher than the other Orleans cultivars as well as, the Garnet and Covington cultivars treated with the three organic pesticides. Orleans control also had the lowest L value of 75.34± 0.7, which was significantly (P<0.05) lower than all the other cultivars treated with organic pesticides. The three organic pesticides influenced the protein, β-carotene, and color contents of the sweet potato cultivars.

## INTRODUCTION

Sweetpotatoes rank as the world’s seventh most important food. Sweetpotatoes are a rich source of vitamin C, starch, sugar, and beta-carotene. To meet rising demand, organic sweetpotato production has increased substantially in recent years, achieving a record high production of 3.1 billion pounds in 2016 (usda.gov, 2017). There is a growing body of evidence that shows some health benefits of organic foods compared to conventionally-grown foods. Organic farming has been demonstrated to have less environmental impact than conventional approaches (reference). Organic farming is designed to benefit the environment by reducing pollution and conserving water and soil quality. This study was done to show the effect that pesticide may have on the nutritional composition of organically grown sweetpotatoes.

## OBJECTIVE

To evaluate the nutritional and physical contents of sweetpotato cultivars (Covington, Garnet, and Orleans) treated with organic pesticides (Azadirachtin, Pyrethrin, Spinosad).

## MATERIALS AND METHODS

### Samples

Samples were sweetpotato cultivars (Covington, Garnet, and Orleans) treated with organic pesticides (Azadirachtin, Pyrethrin, Spinosad). Each cultivars had a control group.

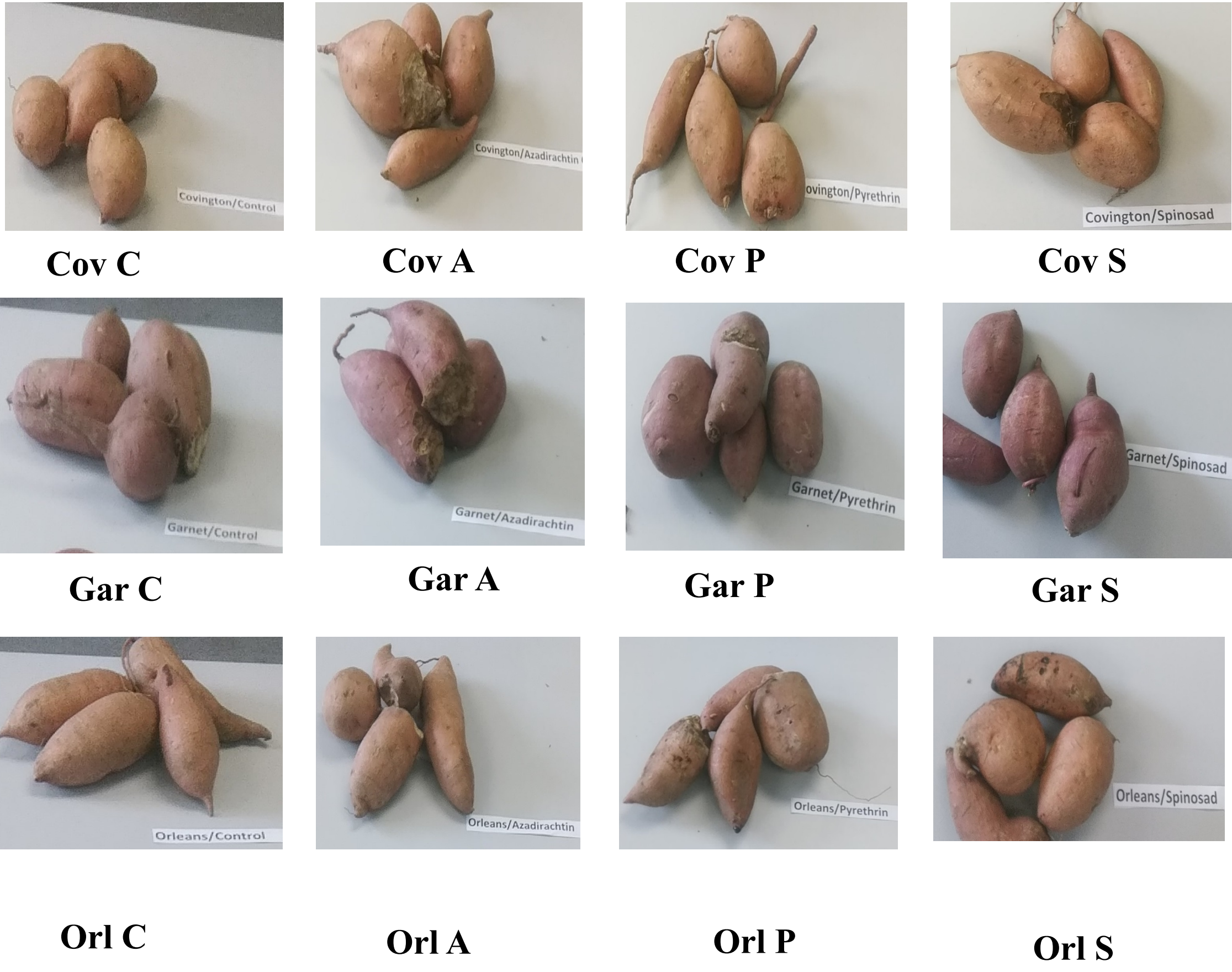


Figure 1: Organic sweet potatoes/Treatment

### ANALYSES

**Protein:** Protein content was determined using the Bradford method. Samples (10 g) were ground and 1.0 g of the sample was extracted using 20 mL 0.1N NaOH. Samples were vortexed and centrifuged. 100 μL sample were mixed with diluted dye reagent. The absorbance was measured at 595 nm.

**Vitamin C:** Vitamin C content was determined using the 2,6- Dichlorophenol indophenol (DCPIP) dye method. 5 g sample was extracted with 50 mL of extraction solution called metaphosphoric acid. The samples were titrated using (DCPIP) until a faint pink endpoint was reached.

**Fiber:** Percentage of fiber was determined using AOAC (ANKOM2000) by filter bag technique. Samples (0.95-1 g) were used for the analysis.

**Moisture:** Percent moisture was analyzed using the conventional oven drying method. Samples (5 g) were weighed in aluminum pans and heated overnight in a conventional oven at 105°C. The samples were cooled in a desiccator, weighed and the percentage of moisture calculated.

**Color:** Sweetpotato samples were cut in two freshly cut surface and the color was measured using the Minolta chroma-meter. L\* a\* b\* values were recorded.

**Texture:** Texture was determined using the Instron electromechanical testing system. Samples (diameter 7 mm) were cut from sweetpotatoes. The force (kN) required to break the sample in two pieces at crosshead speed of 10mm/min was taken as the measure of firmness.

**Ash:** Percent ash was analyzed using the muffle furnace. Samples (5 g) were weighed in pre-dried crucibles and ashed at 550°C for 12 hours.

### Data Analysis

One way analysis of variance (ANOVA) was used to determine the differences between sample means and Tukey HSD at P< 0.05 was used to determine which sample means differed.

## RESULTS AND DISCUSSION

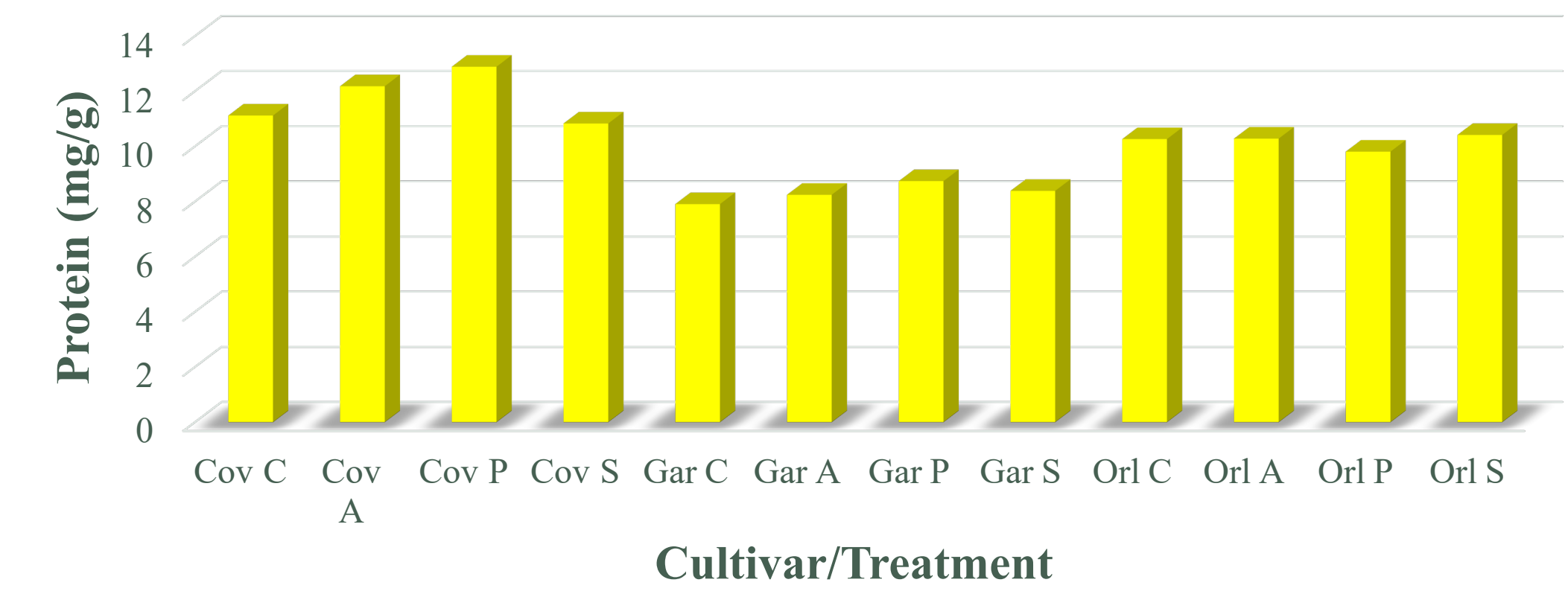


Figure 2: Protein content of Organic sweet potatoes

Covington cultivar control and Covington cultivar treated with Spinosad pesticide had similar protein contents (11.12± 0.09 vs 10.8± 0.09 mg/g).

Covington cultivar treated with Pyrethrin pesticide had the highest mean protein content of 12.89± 0.09 mg/g, which was significantly (P<0.05) higher than all the other Covington cultivars treated with organic pesticides.

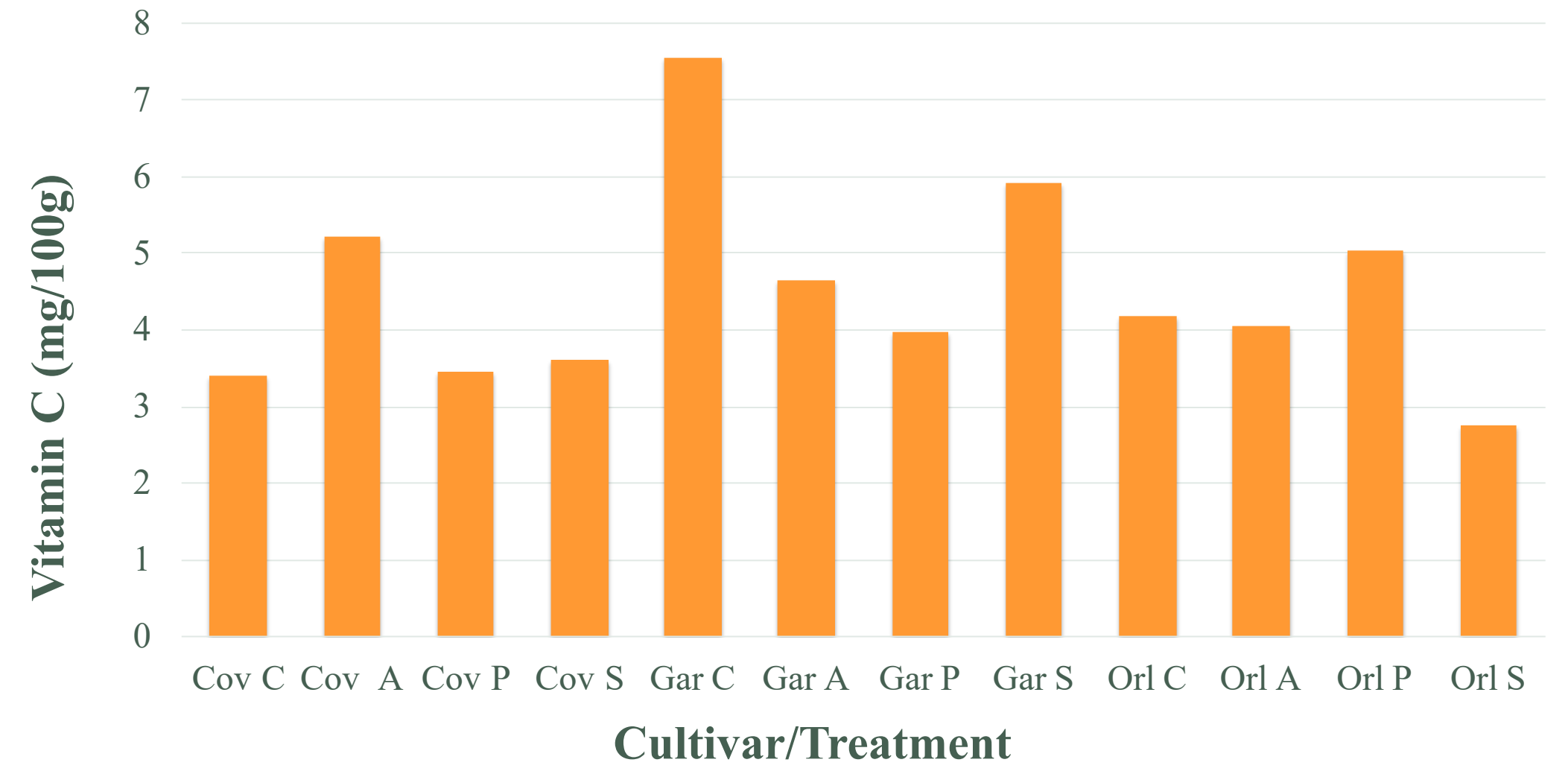


Figure 3: Vitamin C content of Organic sweet potatoes

Garnet untreated (control) had the highest mean Vitamin C content, while Orleans cultivar treated with Spinosad pesticide had the lowest Vitamin C content.

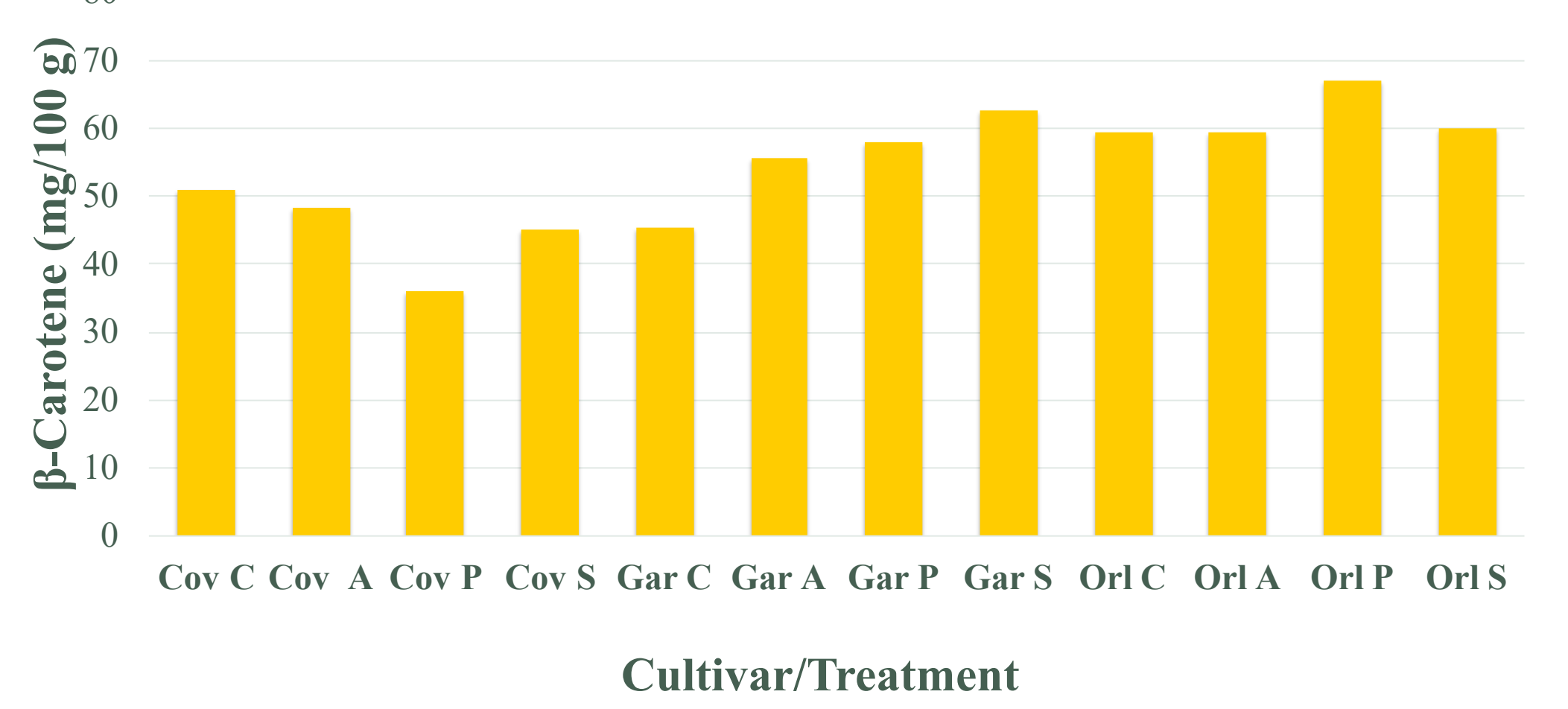


Figure 4: β-Carotene content of Organic sweet potatoes

Garnet cultivar treated with Spinosad pesticide had significantly (P<0.05) higher β-carotene content than Garnet cultivar control (62.61± 2.7 vs 45.47± 2.7 mg/100 g).

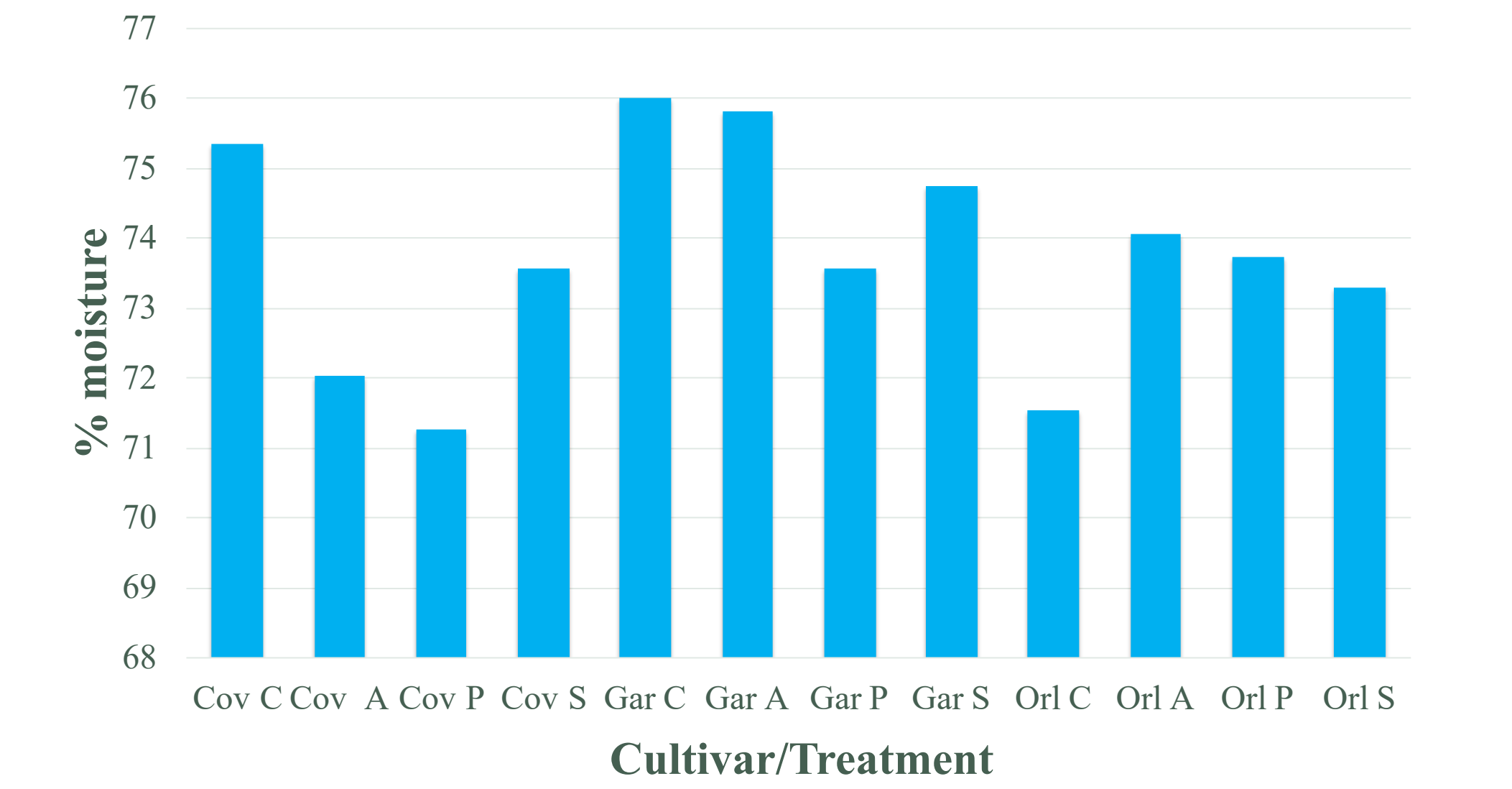


Figure 5: Percent moisture of Organic sweet potatoes

Garnet cultivar control had the highest mean percent moisture, while Covington cultivar treated with pyrethrin pesticide had the lowest percent moisture.

## RESULTS AND DISCUSSION

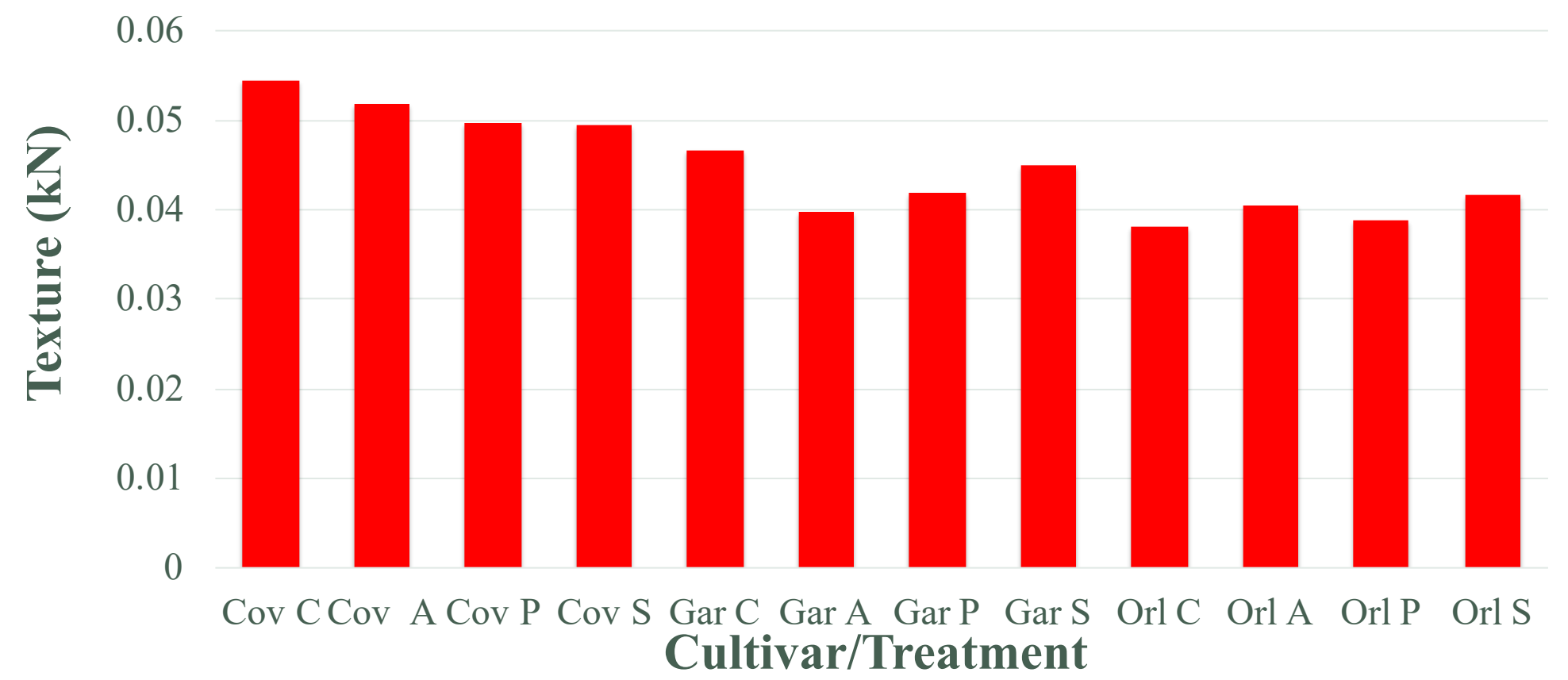


Figure 6: Texture of Organic sweet potatoes

Covington cultivar control had the highest mean texture, while Orleans cultivar untreated (control) had the lowest mean texture.

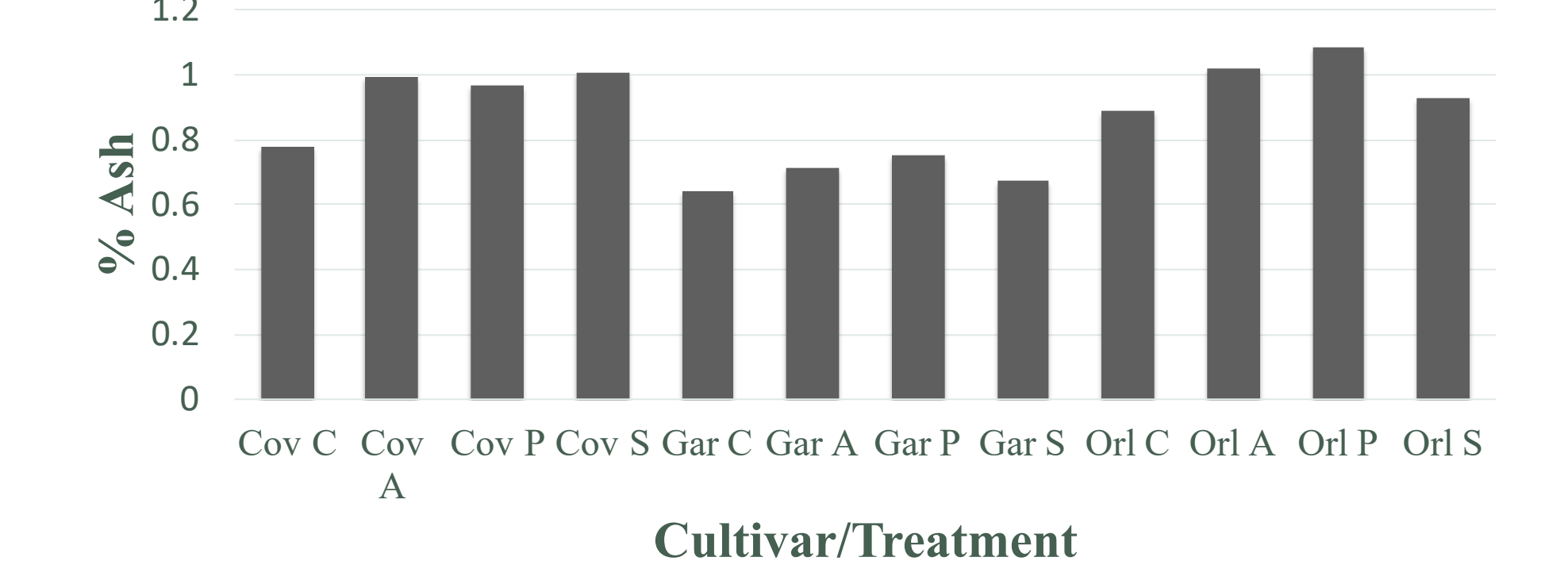


Figure 7: Percent ash of Organic sweet potatoes

Orleans cultivar treated with pyrethrin pesticide had the highest percent ash, while Garnet cultivar untreated (control) had the lowest percent ash.

Table 1: Color values of Organic sweet potatoes

Cultivar/Treatment	L*-value	a*-value	b*-value
Cov C	75.9	28.9	44.8
Cov A	75.8	26.2	42.5
Cov P	75.5	27.8	44.6
Cov S	77.8	25.0	41.5
Gar C	77.8	25.4	42.7
Gar A	77.6	24.7	40.9
Gar P	79.0	24.8	40.6
Gar S	78.5	25.1	41.0
Orl C	75.3	29.9	47.7
Orl A	77.0	26.9	42.1
Orl P	77.8	25.9	40.8
Orl S	77.2	27.7	42.9

Orleans cultivar untreated (control) had the highest mean b value (blue-yellow components) of 47.8± 1.1, which was significantly (P<0.05) higher than all the other Orleans cultivars as well as the Garnet and Covington cultivars treated with the three organic pesticides.

This cultivar also had the lowest L value (darkness-lightness) of 75.34± 0.75, which was significantly (P<0.05) lower than all the other cultivars treated with organic pesticides, this showed that it was darker in color.

## CONCLUSION

The organic pesticides influenced the Protein, β-carotene, and color contents of the sweetpotato cultivars.

## ACKNOWLEDGEMENTS

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## REFERENCES

Forman J, Silverstein J. (2012) Comm on Nutrition; Council on Environmental Health, Organic foods: Health and Environmental Advantages and Disadvantages. Pediatrics (volume 130/ Issue 5).  
Bond J, (2017). U.S. Sweet Potato Production Swells. Economic Research Service, US Department of Agriculture.