

North Carolina Agricultural and Technical State University  
**Aggie Digital Collections and Scholarship**

---

Spring 2020 Graduate Student Research  
Symposium

Graduate Research

---

Spring 2020

## **Impact of Proteolytic Hydrolysis on Tocopherols and B vitamins in Peanuts**

Rabiatu Bonku  
*North Carolina Agricultural and Technical State University*

Follow this and additional works at: <https://digital.library.ncat.edu/gradresearchsymposium20>

---

### **Recommended Citation**

Bonku, Rabiatu, "Impact of Proteolytic Hydrolysis on Tocopherols and B vitamins in Peanuts" (2020).  
*Spring 2020 Graduate Student Research Symposium*. 11.  
<https://digital.library.ncat.edu/gradresearchsymposium20/11>

This Poster is brought to you for free and open access by the Graduate Research at Aggie Digital Collections and Scholarship. It has been accepted for inclusion in Spring 2020 Graduate Student Research Symposium by an authorized administrator of Aggie Digital Collections and Scholarship. For more information, please contact [iyanna@ncat.edu](mailto:iyanna@ncat.edu).





# Impact of Proteolytic Hydrolysis on Tocopherols and B vitamins in Peanuts

Rabiatu Bonku

Program: Food and Nutritional Science (MS)

Advisor(s): Jianmei Yu

## Introduction

Peanuts are excellent source of vitamins which are essential micronutrients in human health. Regularly consuming peanuts has been linked to many health benefits due to its balanced nutritional composition. However, peanuts are also rich in allergenic proteins which affects about 2 % of US population (Jiang et al., 2018). While protease treatment effectively reduces peanut allergenicity, it may cause nutrient loss, especially the vitamins.

The objectives of this study were to evaluate the influence of the protease treatment on the tocopherol content and the B vitamins in the raw peanuts.

## Materials and Methods

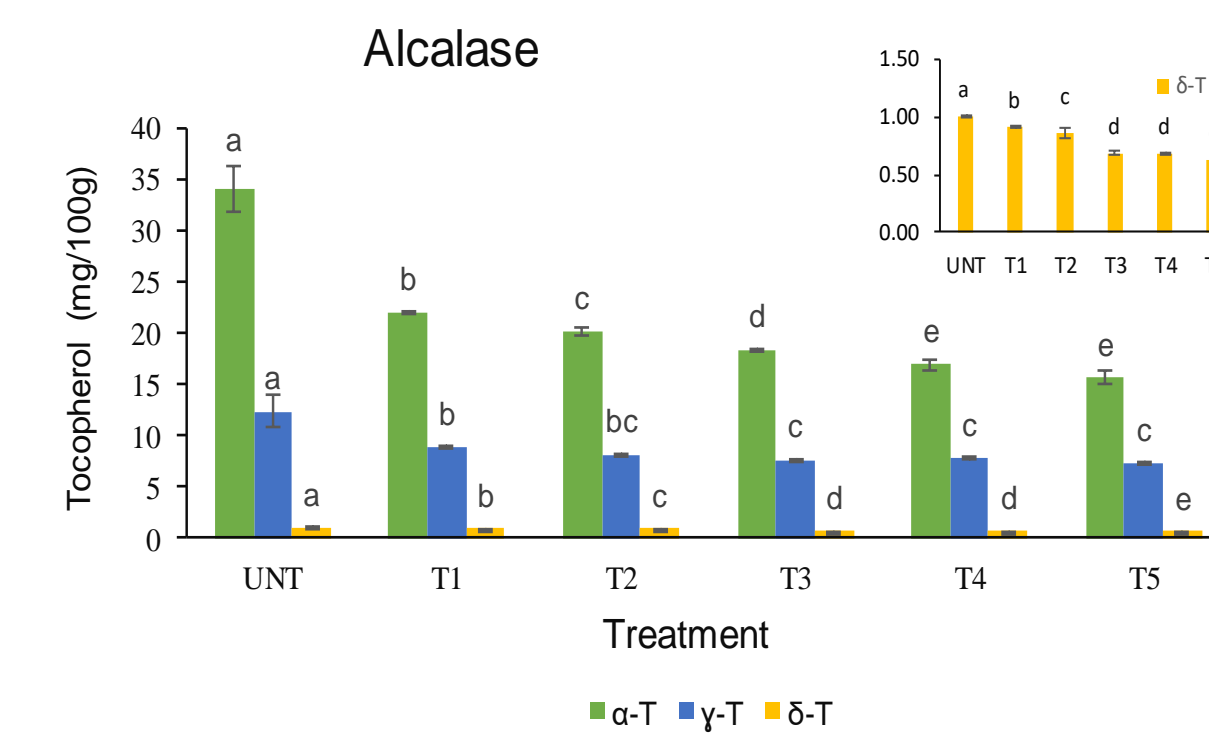
**Materials:** Raw untreated Virginia peanut kernels, raw treated runner peanut kernels, hexane, methanol, TCA.

**Oil Extraction:** Peanut kernel (10g) was weighed, ground using a coffee grinder, then a mortar and pestle into peanut butter. Peanut oil in the butter was extracted using hexane. The extracted was collected in an evaporation flask and concentrated using a Rotavapor at 40°C to remove the hexane.

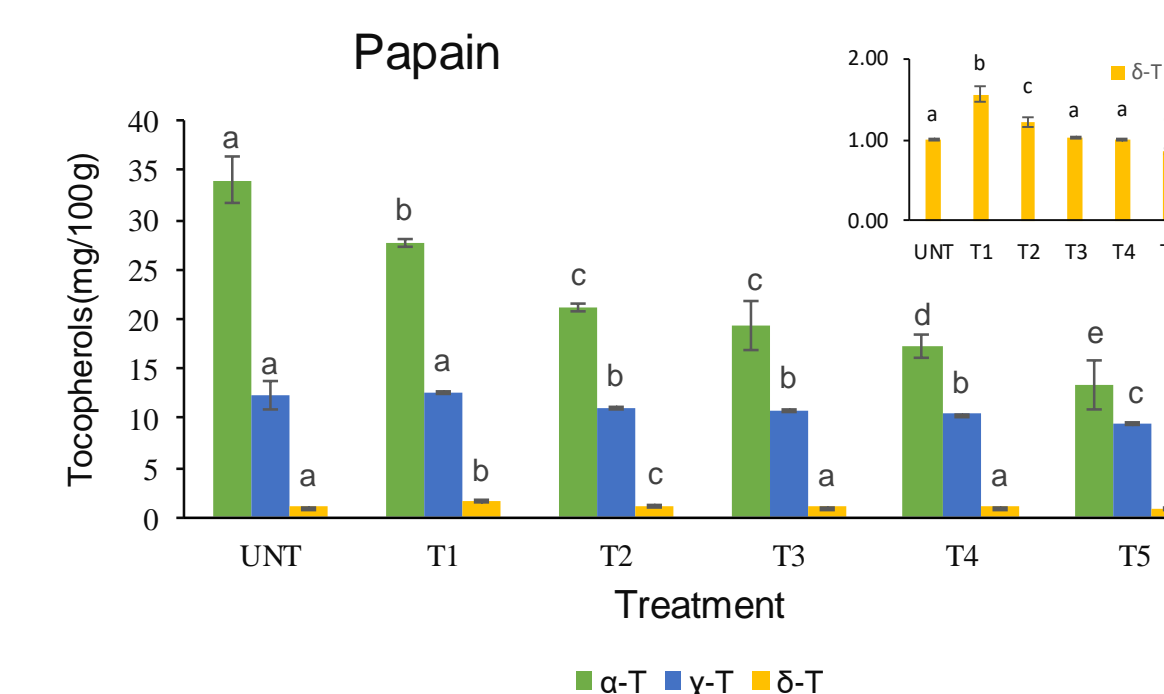
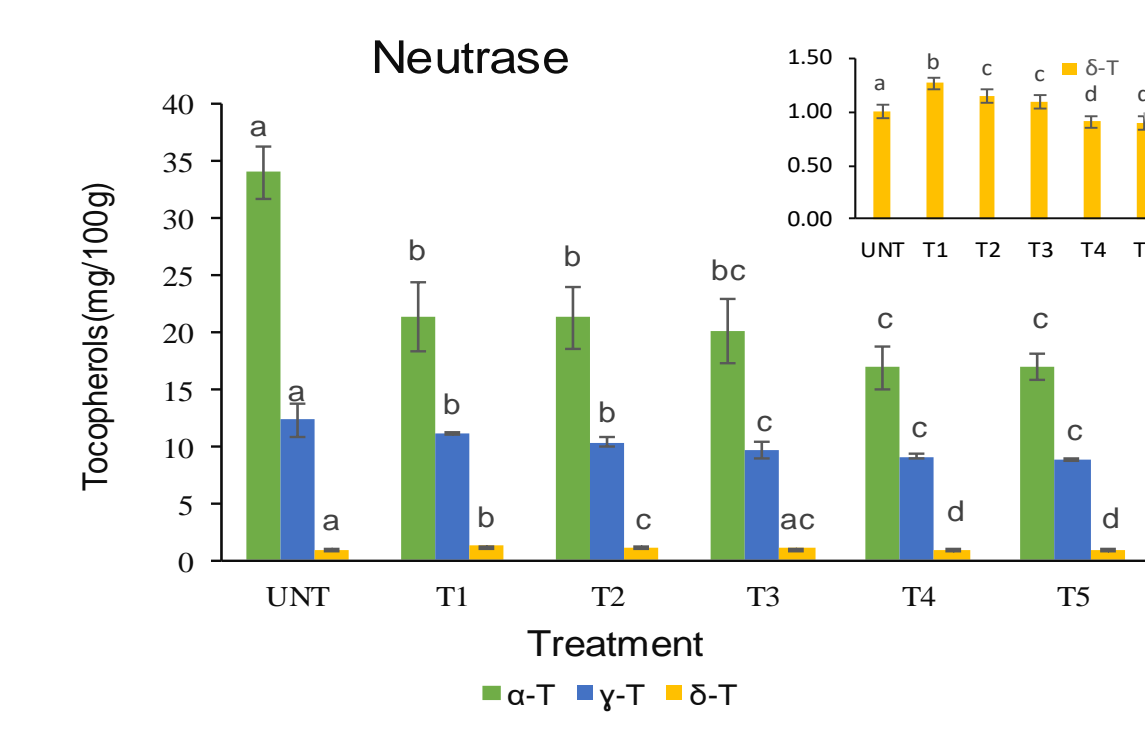
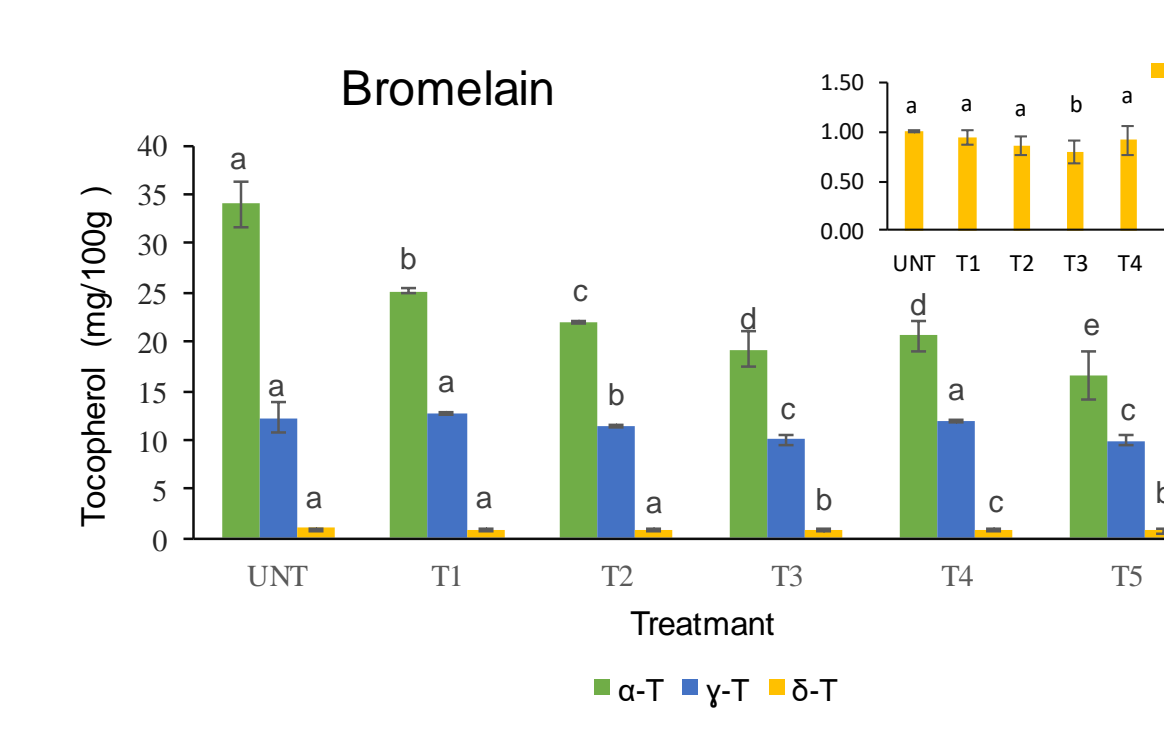
**Tocopherol Analysis:** Peanut oil (100mg) was weighed and diluted properly with hexane and methanol then injected in an HPLC system. The individual tocopherols ( $\alpha$ ,  $\gamma$ , and  $\delta$ ) were separated by Accucore XL C18 column and mobile phase (methanol: water = 96:4, V/V) at a flowrate of 1.0ml/min.  $\alpha$ ,  $\gamma$ , and  $\delta$  tocopherol were detected by UV detector at 230nm.

**B vitamin Analysis:** The B vitamins in the defatted peanut flour was extracted using 10 % TCA and purified by solid phase extraction cartridges and then analyzed by HPLC at a flowrate of 1.0 ml/min. The analytes were separated by Kinetex C18 column (150 × 4.6 mm, 5  $\mu$ m) column. B1 was detected by Waters UV-Vis Dual Wavelength Detector at 254 nm. B2, nicotinic acid, nicotinamide, and B6 were detected by Waters Fluorescence Detector at an excitation wavelength of 290 nm and emission wavelength of 390 nm.

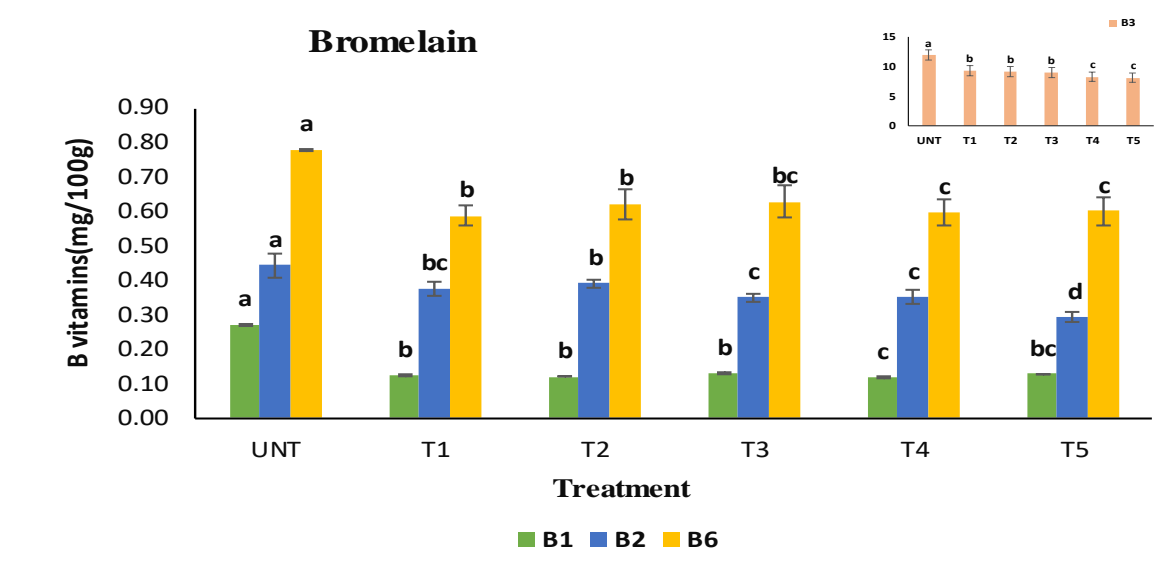
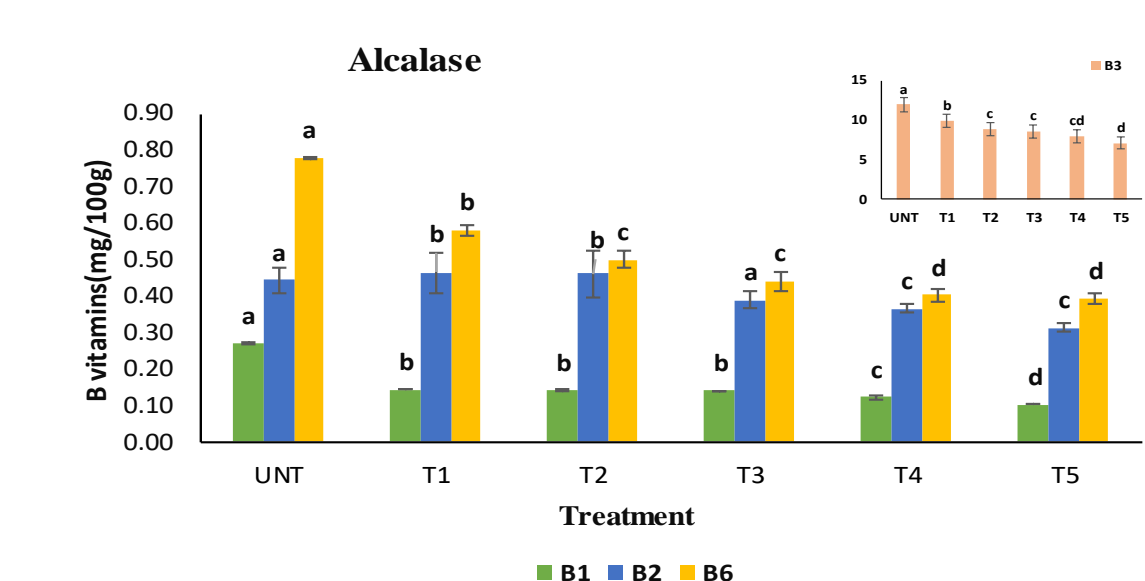
## Results



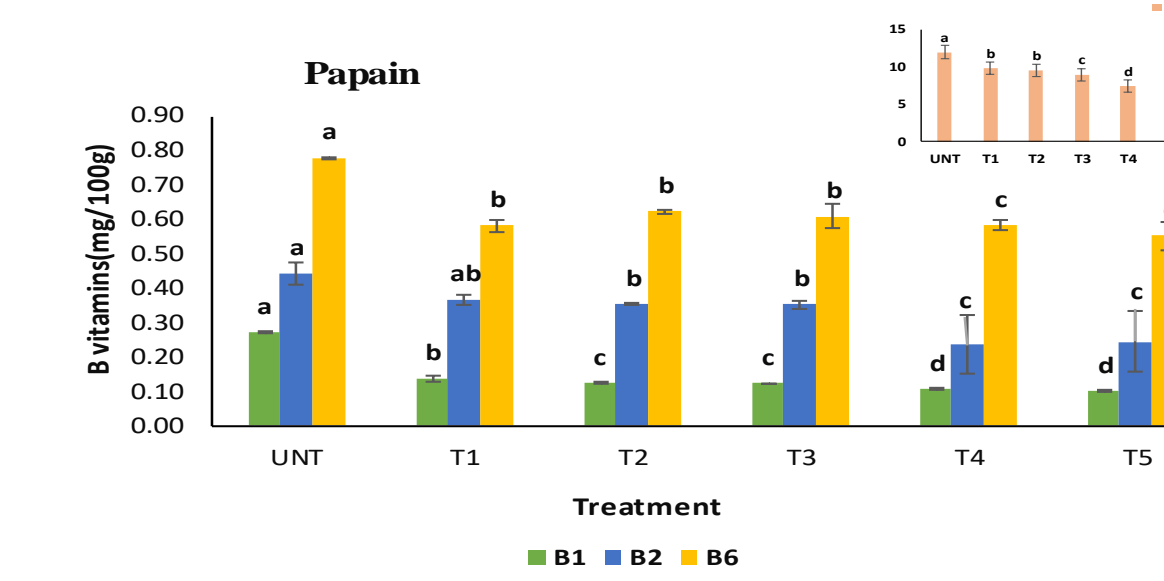
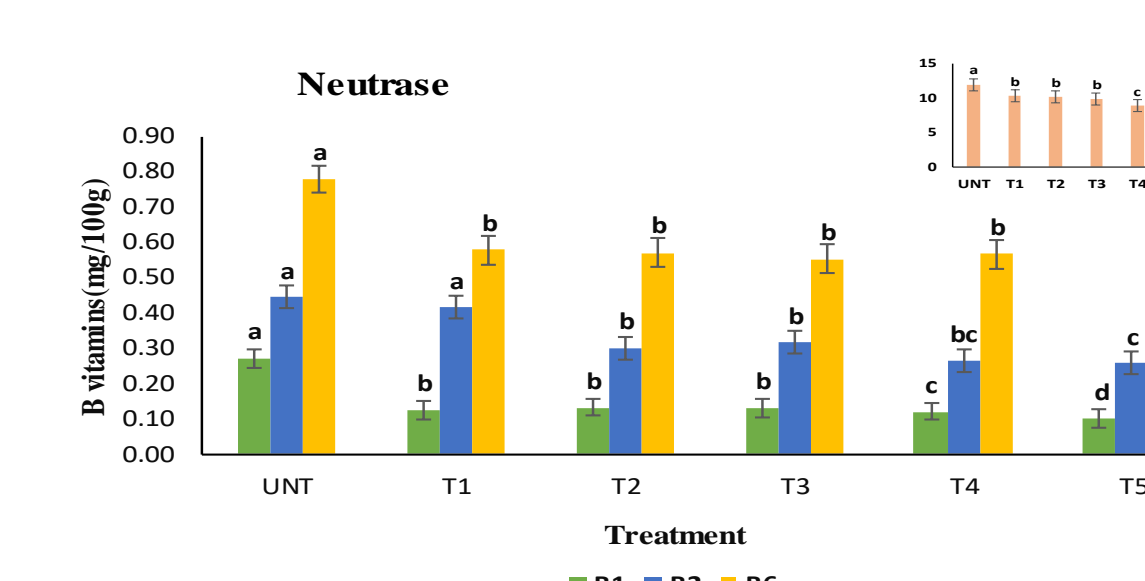
Tocopherols concentrations of raw Virginia peanuts treated with Alcalase and bromelain



Tocopherols concentrations of raw Virginia peanuts treated with Neutrase and papain



B vitamins content of raw Virginia peanuts treated with Alcalase and bromelain



B vitamins concentrations of raw Virginia peanuts treated with Neutrase and papain

## Discussion

- The contents of  $\alpha$ -,  $\gamma$ -, and  $\delta$ -tocopherols in untreated peanuts were 34.02, 12.32 and 1.00 mg/ 100g peanuts, respectively.
- Overall,  $\alpha$ -tocopherol was the most affected while  $\delta$ -tocopherols was the least affected, and higher enzyme concentration resulted in bigger loss of each tocopherol.
- The highest losses of  $\alpha$ -,  $\gamma$ -, and  $\delta$ -tocopherols were 60.87 %, 40.60 % and 36.89 %, respectively.
- The concentrations of vitamins B1, B2, B3 and B6 in the untreated peanuts were 0.27, 0.44, 11.94 and 0.78 mg/100g, respectively.
- Among all B vitamins investigated, vitamin B1 was the most affected and B3 was the least affected.
- The maximum loss of Vitamins B1, B2, B3 and B6 were 63.29 %, 44.83 %, 40.56 % and 49.59 %, respectively.

## Conclusion

- In conclusion, the losses of vitamins in peanuts caused by enzymatic allergen reducing process were significant and vitamin restoration may be needed if the enzyme treated peanuts are to be used as vitamin source.
- Further research will focus on the influence of the protease treatment on macronutrient content of peanuts and their impact on the sensory quality of peanuts.

## Acknowledgement

- This study is sponsored by USDA-NIFA and Ag Research Program at North Carolina A&T State University. Project award number: NC.X274-5-14-170-1.

## References

- Jiang, J., Bushara, O., Ponczek, J., Warren, C., Blumenstock, J., Smith, B., & Gupta, R. (2018). Updated pediatric peanut allergy prevalence in the United States. *Annals of Allergy, Asthma & Immunology*, 121(5), 14.