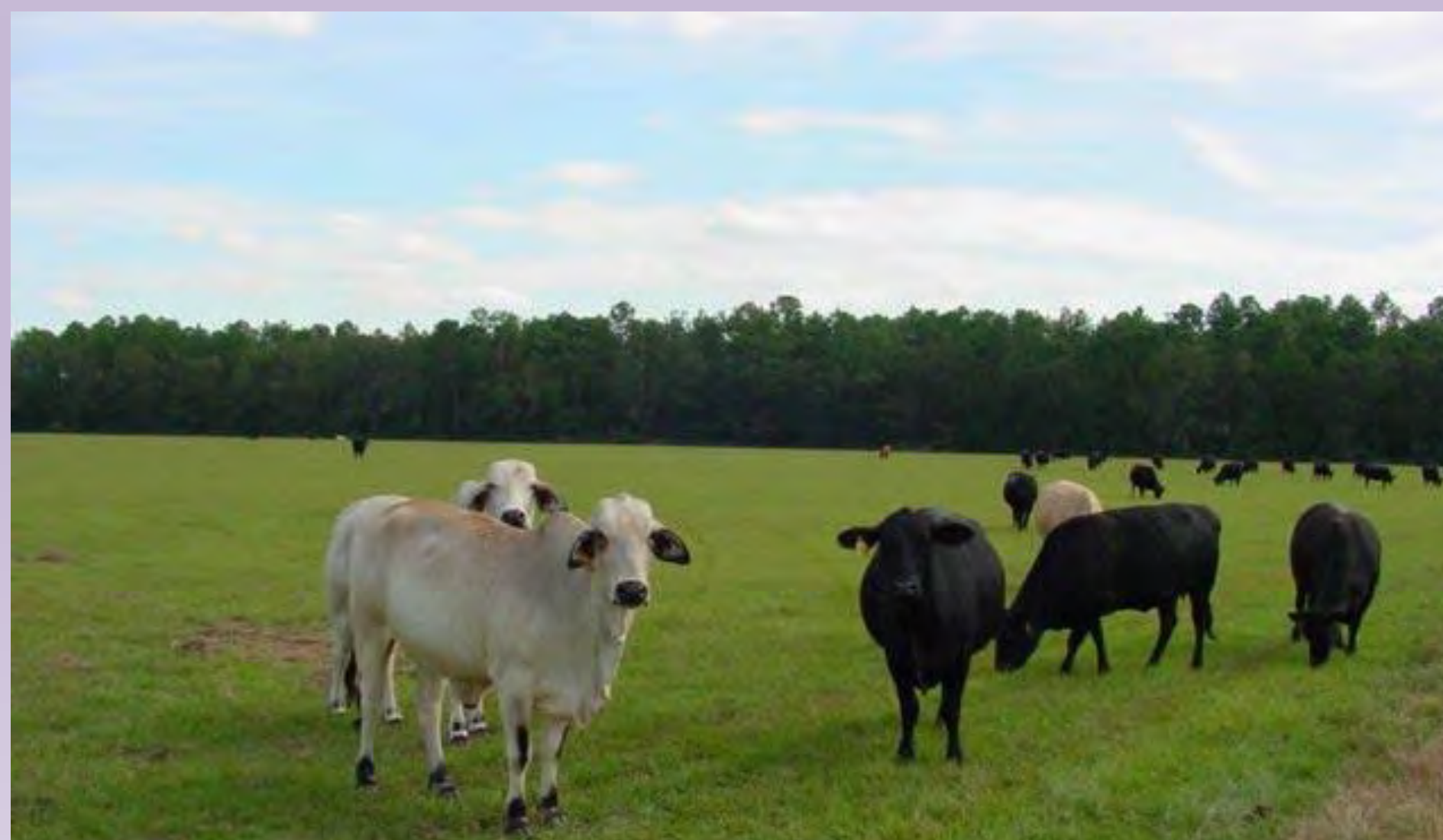


Introduction

- Beef tenderness is the most important attribute affecting consumer beef eating satisfaction
- Numerous studies have indicated steaks from cattle of greater Brahman genetics are tougher than steaks from *Bos taurus* cattle
 - This is attributed to greater calpastatin activity (Wheeler et al., 1990; Shackelford et al., 1991; Pringle et al., 1997)
 - Causes inhibition of calpain-mediated myofibrillar protein degradation
 - Role of calpastatin enacts on steak tenderness of Brahman cattle may be overstated
 - Riley et al. (2005) reported calpastatin activity was poorly correlated to Warner-Bratzler shear force (**WBSF**)
- Research has demonstrated steers of increased Brahman genetics have an increased expression of genes related to collagen crosslinking (Gonzalez et al., 2014)
- Indicating collagen solubility may be a contributor to tenderness of steaks from Brahman cattle



Objectives

- Examine the effect of Brahman genetics on myofibrillar protein degradation, collagen crosslinking, and meat tenderness of *Longissimus lumborum* (LL) steaks

Procedures



Results

Cooked steak characteristics

Warner-Bratzler shear force analysis

- As the percentage of Brahman genetics increased, LL steak thaw loss and WBSF increased (linear, $P < 0.01$)
- There was no effect of Brahman genetics on cook loss ($P = 0.14$)

Sensory analyses

- As the percentage of Brahman genetics increased, sensory panel scores of LL steak tenderness, connective tissue, and juiciness decreased (linear, $P < 0.01$)
 - Indicating steak were tougher, had more connective tissue, and were less juicy
- Brahman genetics had no effect on beef flavor or off flavor scores ($P > 0.35$)

Myofibrillar protein degradation and collagen crosslinking

Myofibrillar protein degradation

- Steaks from steers of greater Brahman genetics had decreased intensity of 38 kDa desmin, 34 kDa troponin-T, and 30 kDa troponin-T degradation bands (linear, $P < 0.03$)
- Increasing Brahman genetics increased ($P = 0.04$) intensity of 36 kDa degraded troponin-T band

Hydroxylysyl pyridinoline concentration

- There was no effect ($P = 0.14$) of Brahman genetics on the amount of LL steak hydroxylysyl pyridinoline collagen crosslinks

Conclusions

- *Longissimus lumborum* steaks originating from steers of greater percentage of Brahman genetics had reduced tenderness when measured objectively and subjectively
- Trained sensory panelist detected an increase in connective tissue content as percentage of Brahman increased
- Decreases in tenderness steaks from steers with greater Brahman genetics were most likely due to the reduction in degradation of desmin and troponin-T proteins
 - Not due to increases in hydroxylysyl pyridinoline crosslinks
 - It is hypothesized Brahman genetics may increase other heat stable crosslinks, which may be responsible for the increase in connective tissue detected by panelists



Procedures

Animals and steak fabrication

- University of Florida Multi-breed Herd steers (n =72) born in 2012 and 2013 were classified into 4 treatment categories based on percentage of Angus and Brahman genetics
 - **100% Angus/0% Brahman**
 - **62.5% Angus/32.5% Brahman**
 - **50% Angus/50% Brahman**
 - **0% Angus/100% Brahman**
- Steers were harvested at common compositional endpoint of 1.0-1.5 cm backfat
- A 7.62-cm thick LL roast extending from the 13th rib towards posterior end of loin was collected from each carcass and aged 14 d
- After aging, 3, 2.54-cm thick steaks were fabricated from each roast
 - Steak 1 → Utilized for Warner-Bratzler shear force (**WBSF**)
 - Steak 2 → Utilized for trained sensory evaluation
 - Steak 3 → Utilized for myofibrillar protein degradation and collagen crosslink analyses

Warner-Bratzler shear force analysis

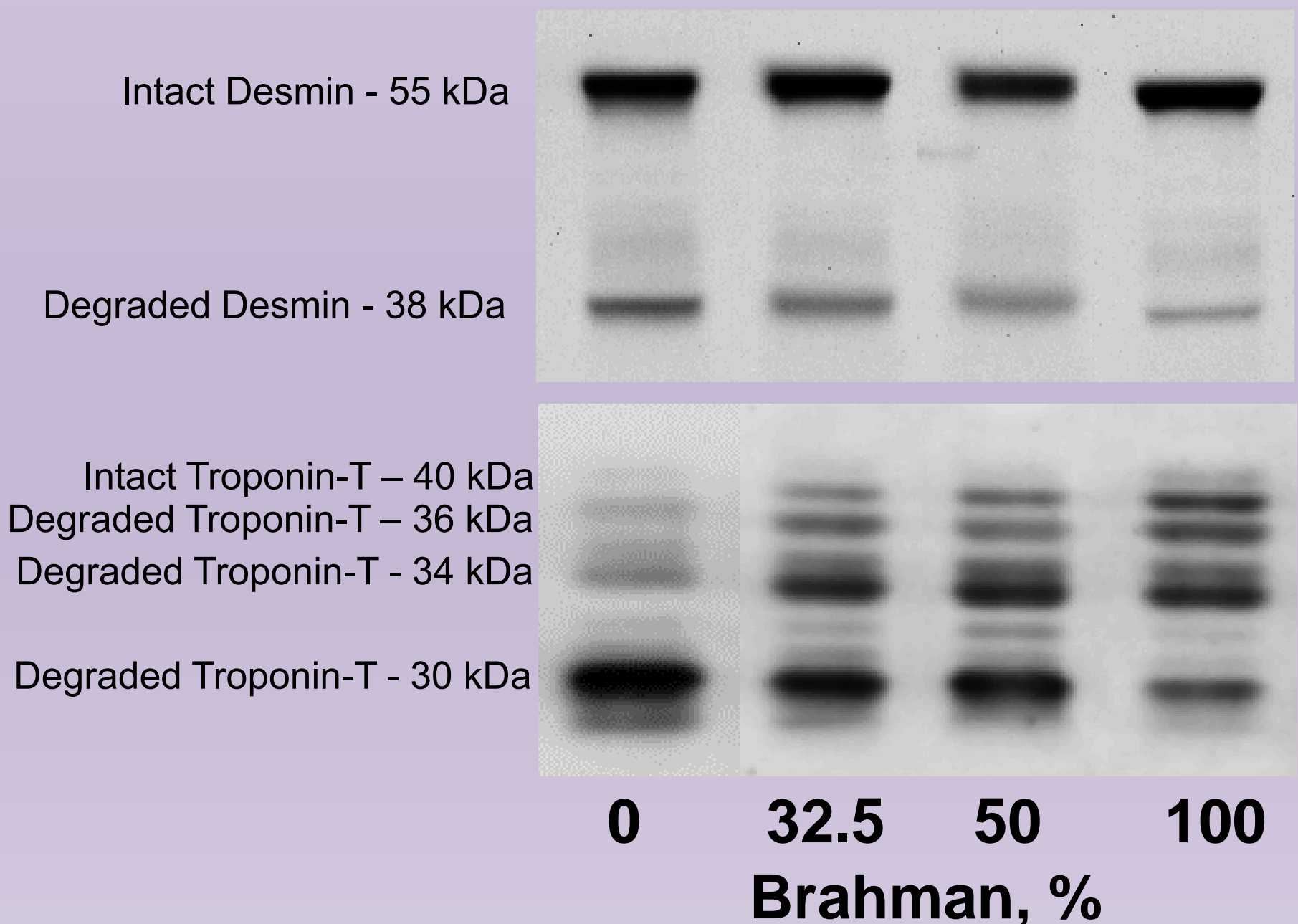
- Steaks cooked on open-hearth Farberware grills (Model 450-A; Yonkers, NY)
 - Steaks cooked to internal temperature of 71°C and chilled 24 h at 4 ± 1°C before coring
 - 6 cores, 1.27 cm in diameter, removed parallel to muscle fiber
 - Each core sheared once perpendicular to muscle fiber using an Instron testing machine (Instron, Canton, MA)

Sensory analysis

- Steaks cooked on open-hearth Farberware grills (Model 450-A; Yonkers, NY)
- Steaks cooked to internal temperature of 71°C
 - Cut into 1.27 × 1.27 × 2.54 cm cubes
 - Two cubes of each sample presented to 8-member trained panel
- Evaluated 6 samples per session for:
 - Tenderness, connective tissue, juiciness, beef flavor intensity, and off-flavor intensity using 8-poin scales
 - 1= extremely tough, abundant, extremely dry, extremely bland, and extreme off-flavor
 - 8= extremely tender, none, extremely juicy, extremely intense, no off-flavor

Desmin and Troponin-T analysis

- Desmin and troponin-T degradation quantified using western blot procedures adapted from Melody et al. (2004)



Collage crosslink analysis

- 100 mg of dried sample was hydrolyzed in 2 mL 6 M HCl at 105°C
 - Samples were diluted to 10 mL and pH raised to 7.0
- Sample concentrations of the collagen crosslink hydroxylysyl pyridinoline were analyzed using a commercial ELISA kit (8004; Quidel Corporation, San Diego, CA)

Statistical analysis

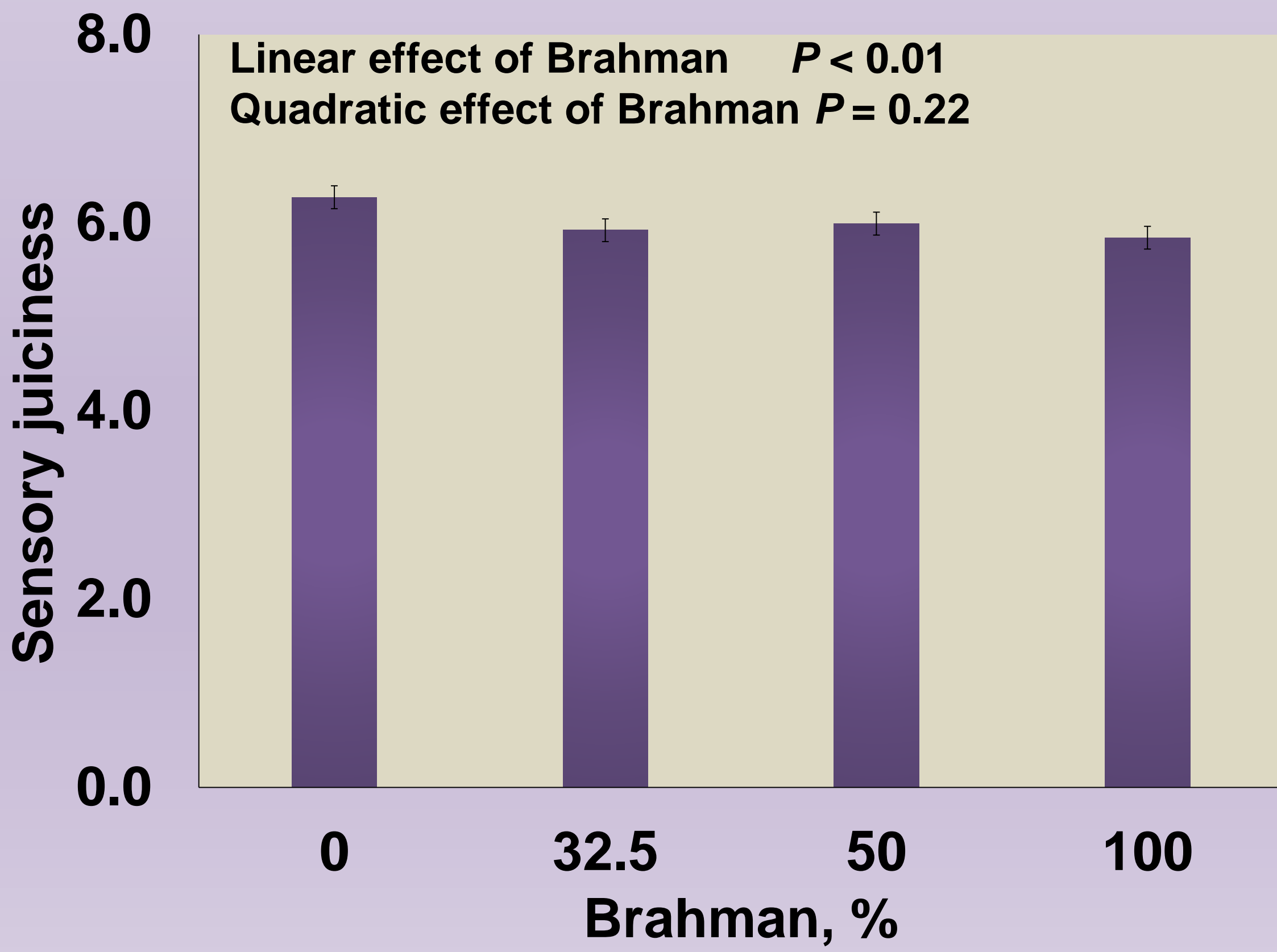
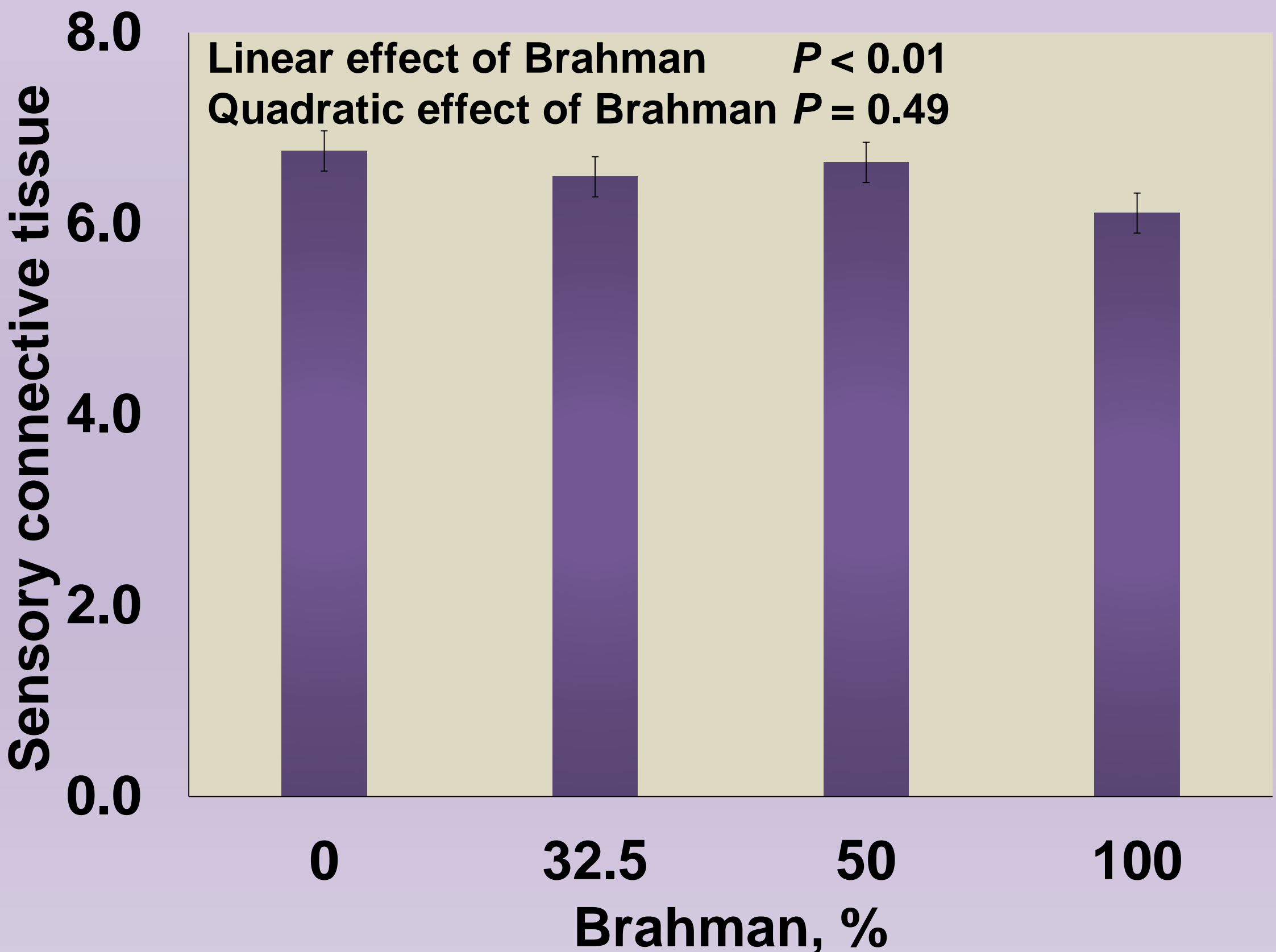
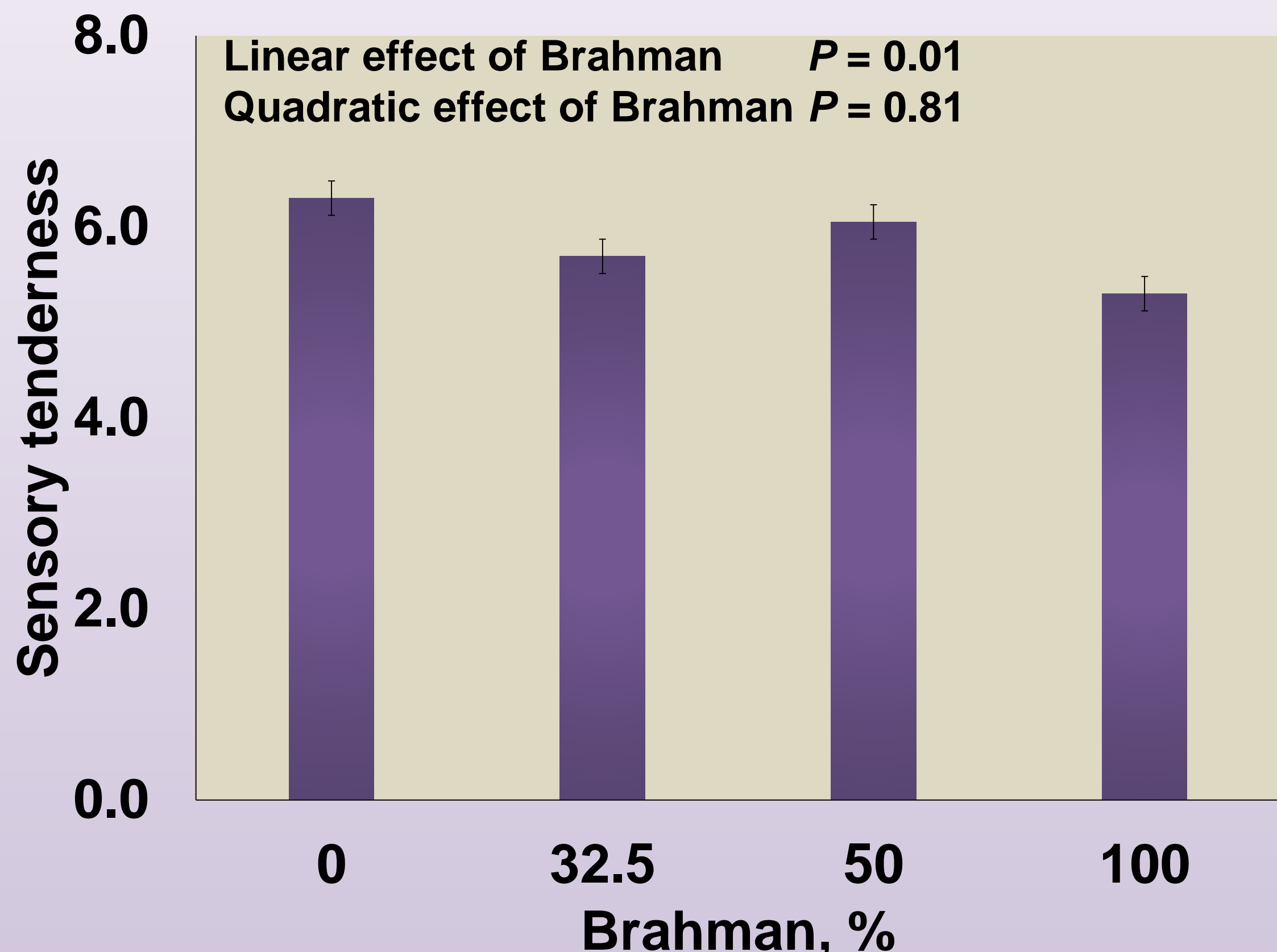
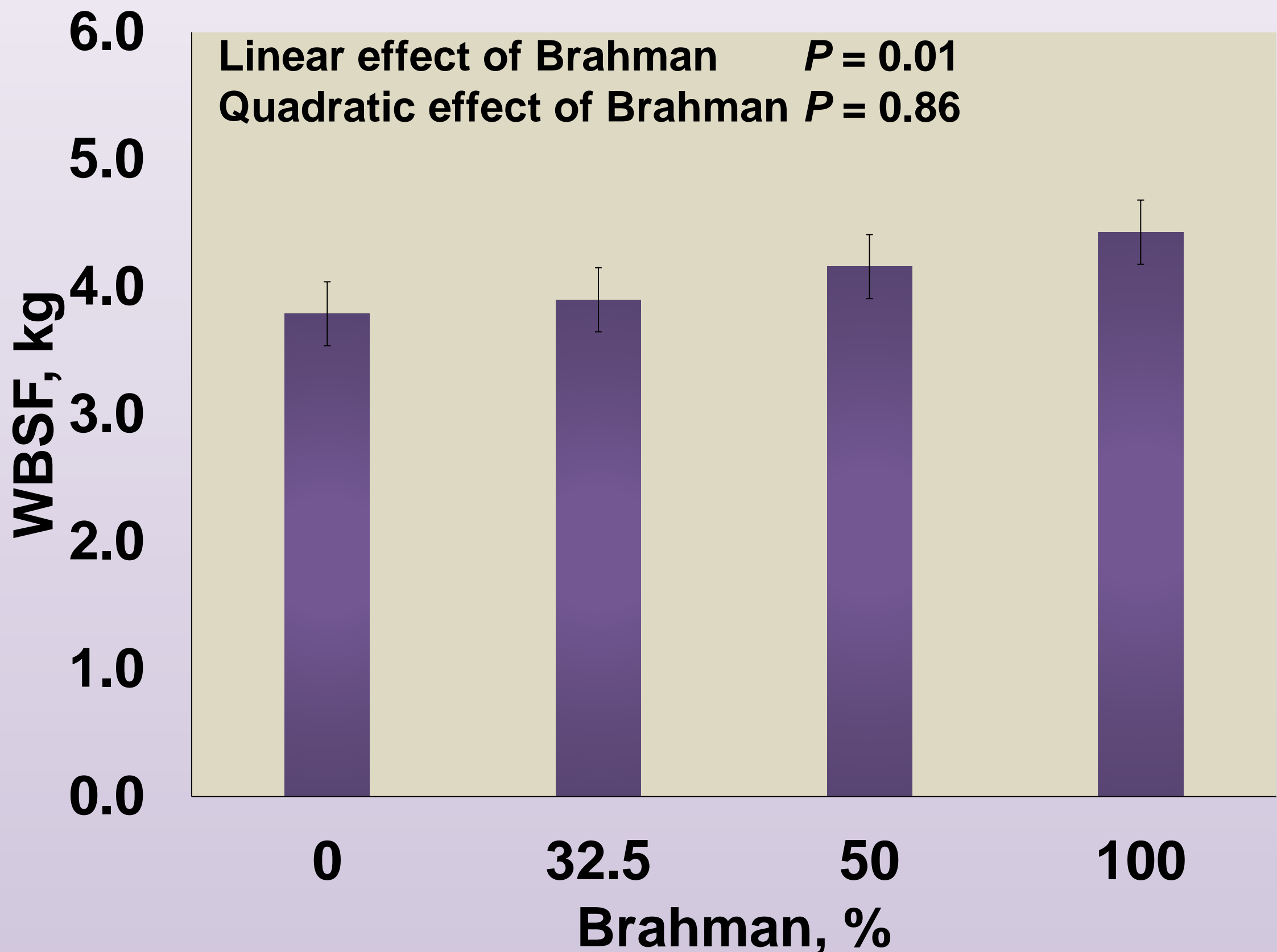
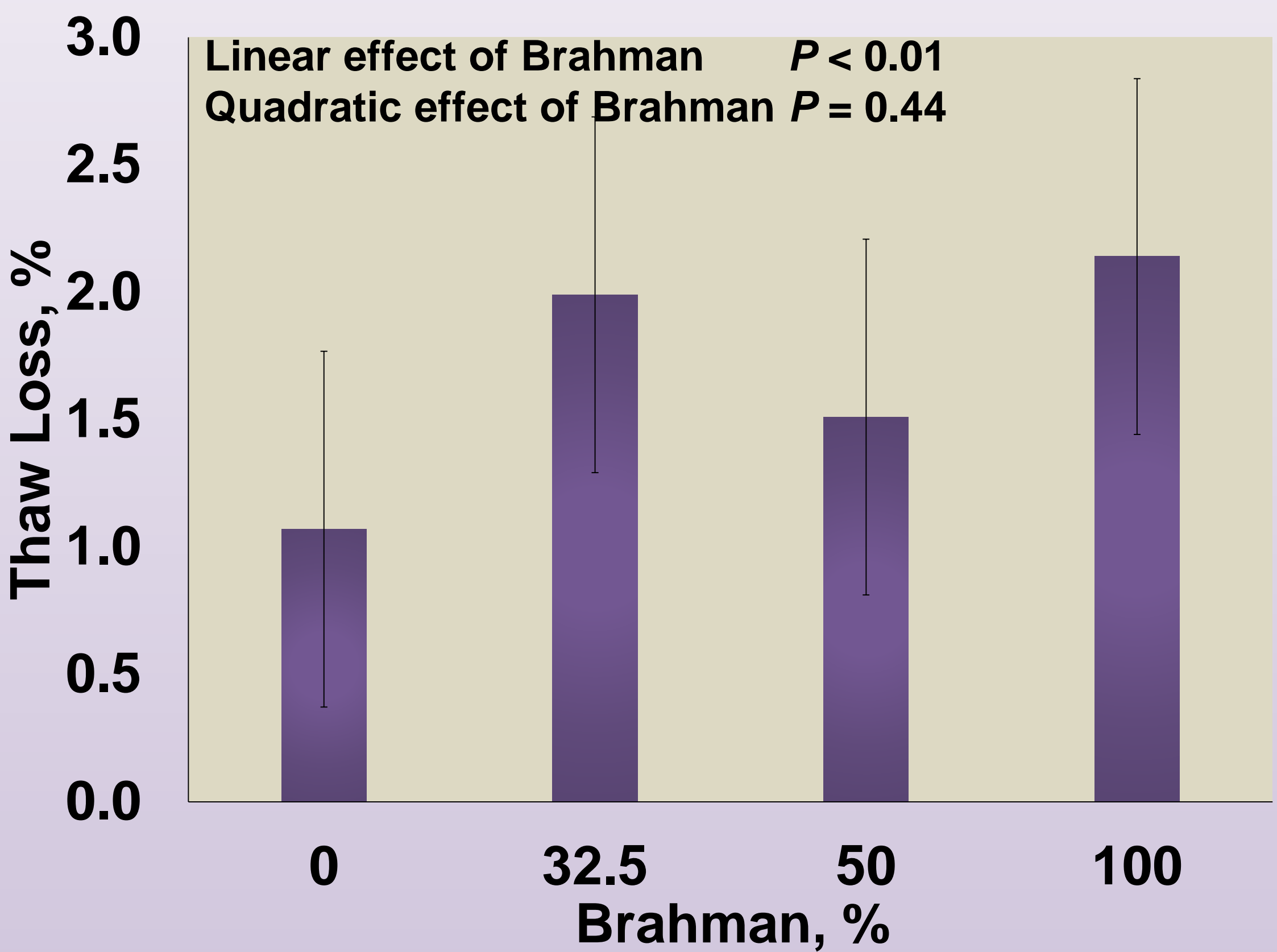
- Data were analyzed as a generalized randomized complete block design using the MIXED procedure of SAS (SAS Institute Inc., Cary NC)
 - Fixed effect: Treatment
 - Random effect: Year
 - Linear and quadratic contrasts for Brahman percentage were tested
- Differences were considered significant at $P \leq 0.05$ and tendencies at $P > 0.05$ and $P \leq 0.10$

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Cooked steak characteristic results

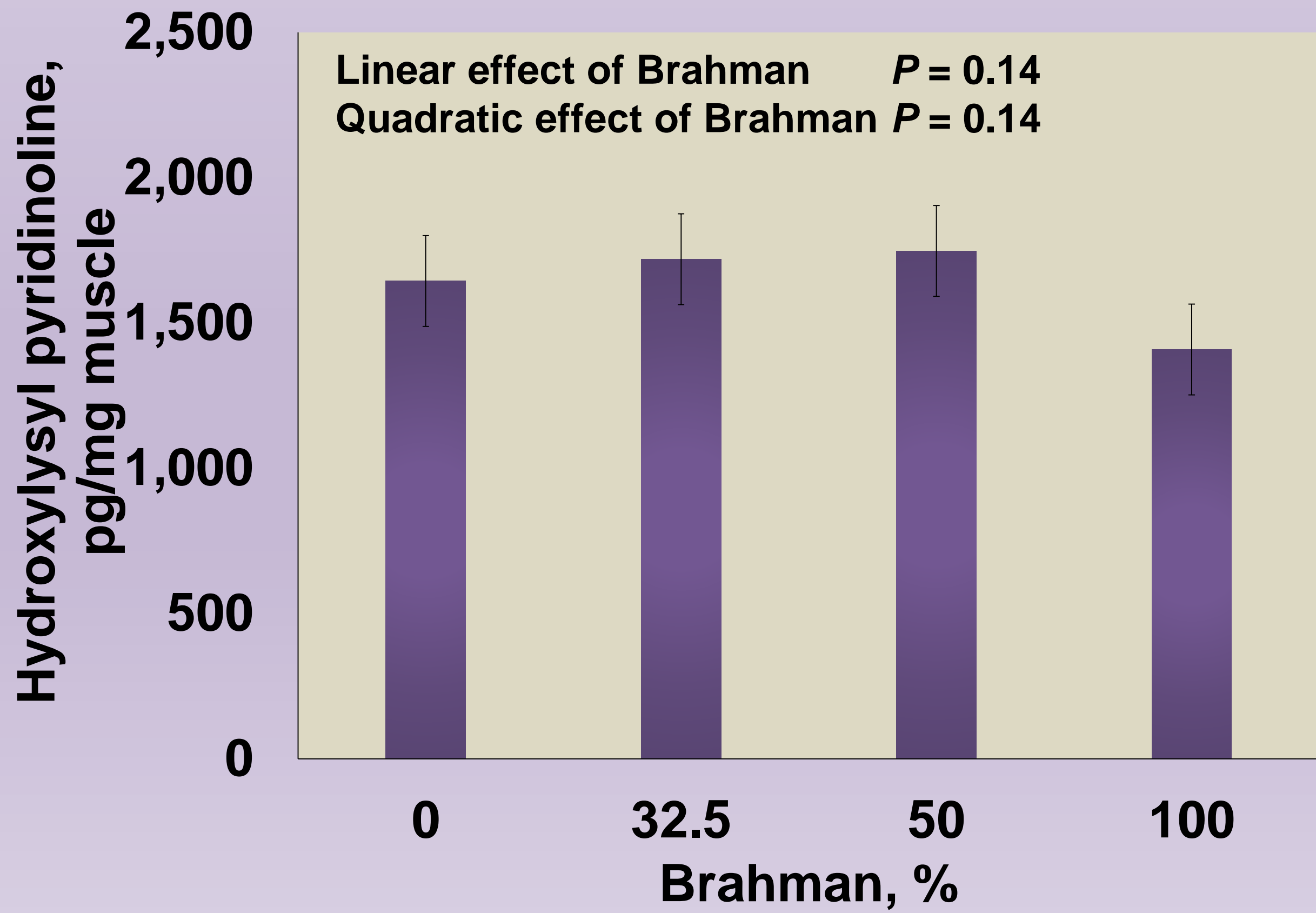
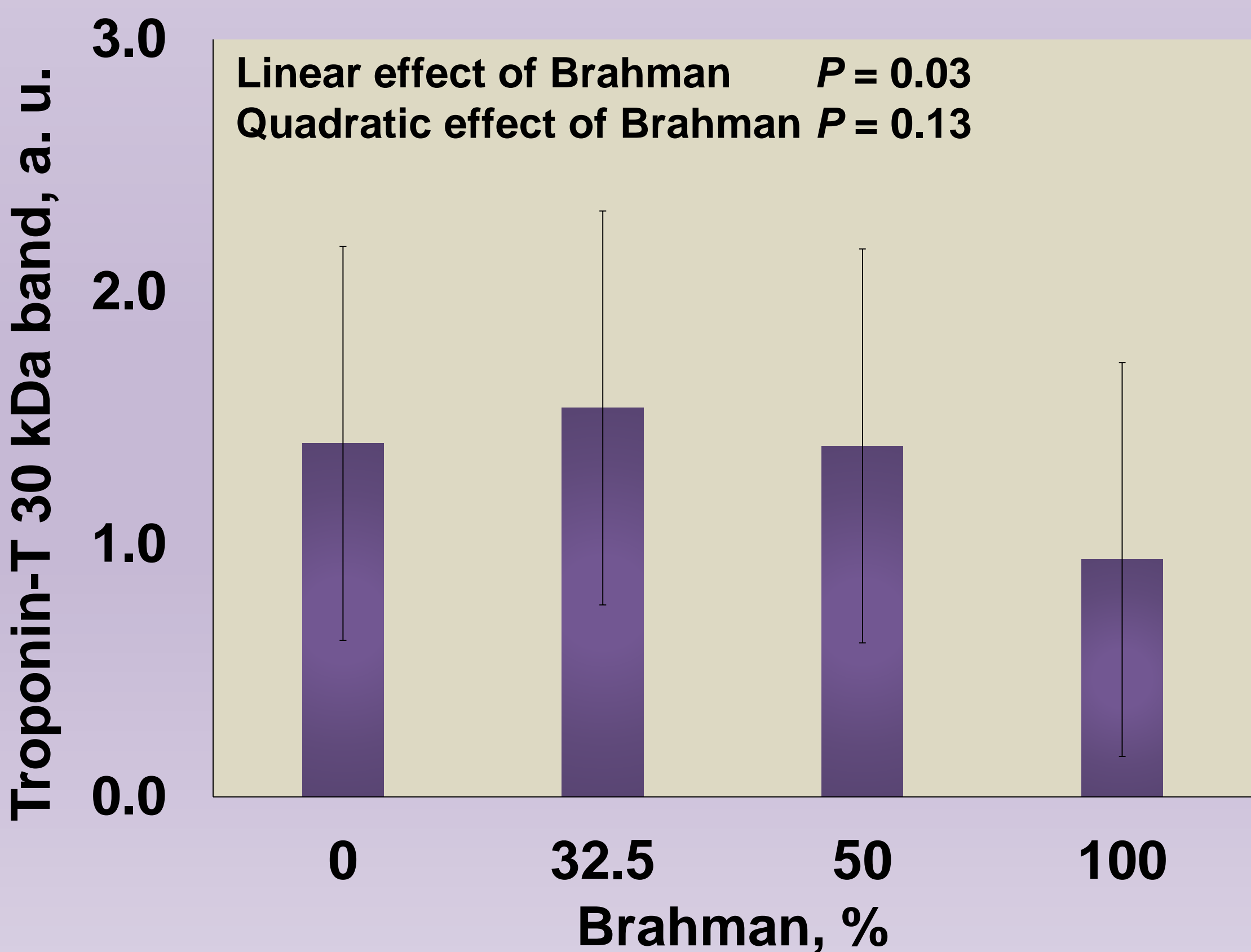
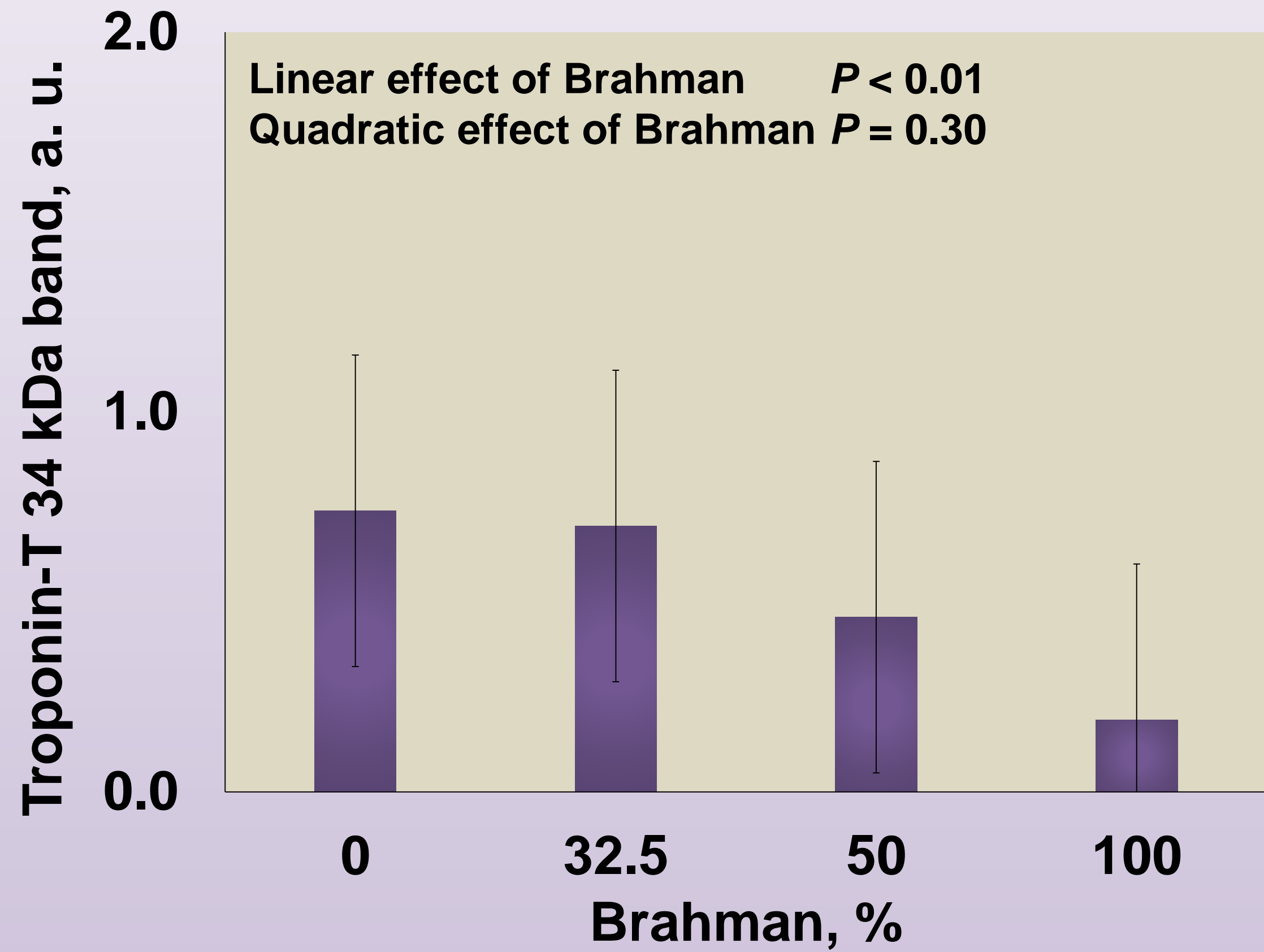
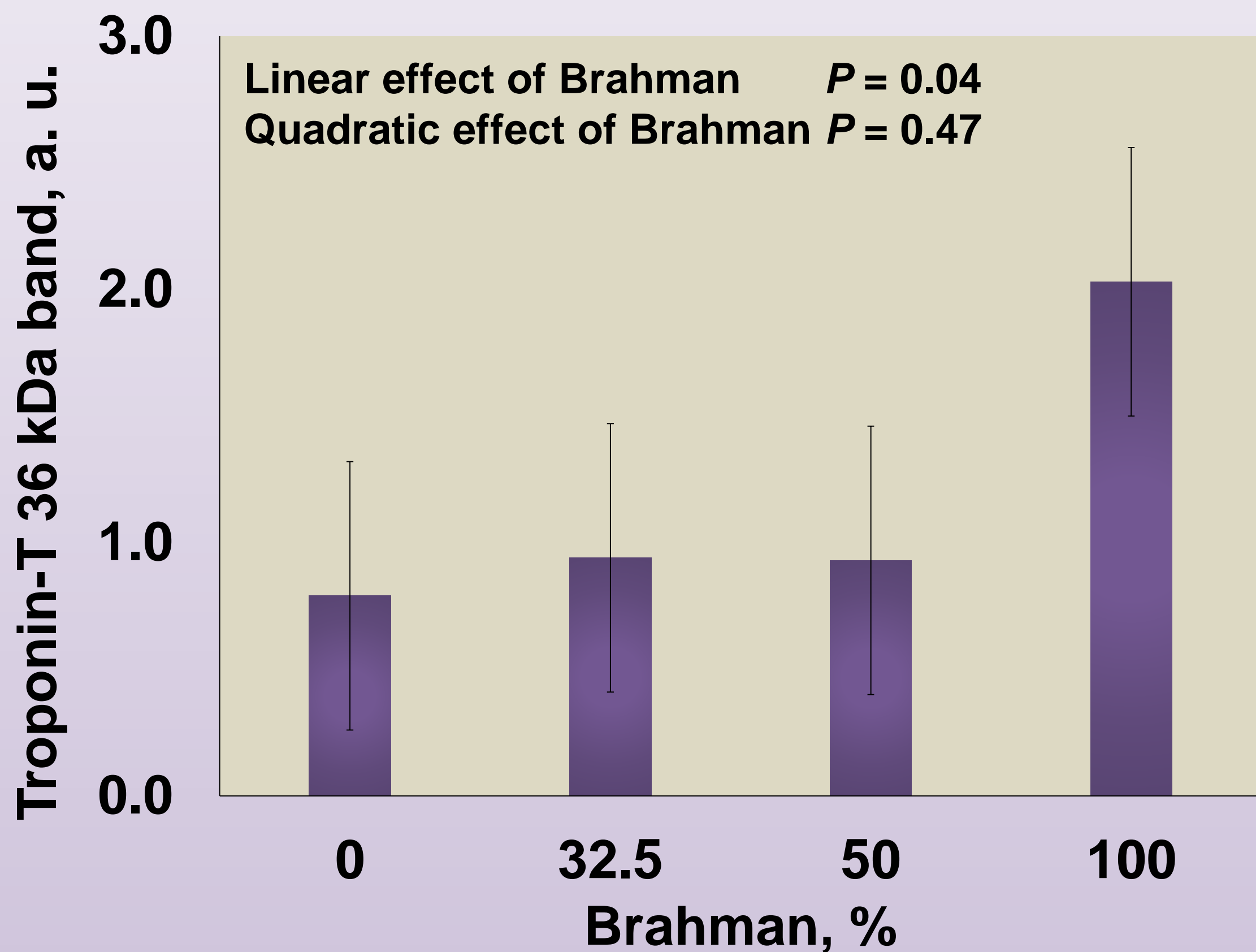
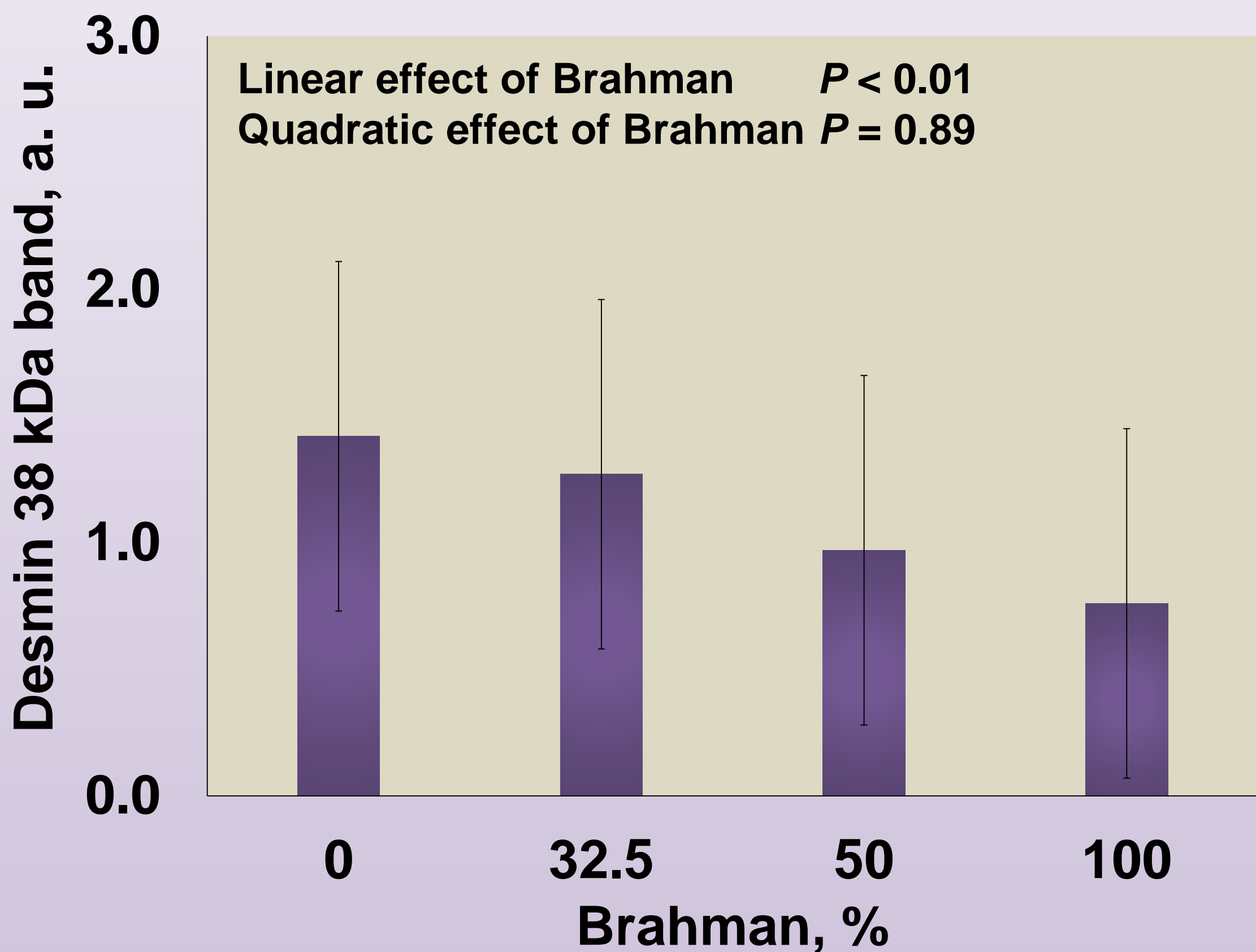


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Myofibrillar protein degradation and collagen crosslinking results



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