



The values for the frequency of hind paw attention following administration of normal, uncooked beans, and serotonin precursor diet were 24.00±2.07, 8.14±1.18, and 6.00±0.82/5 min, respectively, in the first trial, after 5 min of formalin administration. The frequency of hind paw attention was significantly lower in the uncooked beans and serotonin precursor fed mice compared to control (p<0.05). In the second trial, after 30 min of formalin administration, the values were 1.20±0.47, 0.43±0.30, and 0.43±0.30. The frequency of hind paw attention was significantly lower in the serotonin precursor and uncooked beans group compared to control (p<0.05) (Fig. 3).

The values for the duration of hind paw attention following administration of normal, uncooked beans, and serotonin precursor diet were 89.38±11.33, 53.59±4.14, and 39.03±5.51 s, respectively. The duration of hind paw attention fed with uncooked beans and

serotonin precursor was statistically shorter than those fed with control diet (p<0.05). In the second trial, after 30 min of administration of formalin, the duration of paw attention was 2.60±0.60, 0.37±0.24, and 0.55±0.39 s, respectively. The duration of hind paw attention was significantly lower in the uncooked beans and serotonin precursor fed mice compared to control (p<0.05) (Fig. 4).

DISCUSSION

The response of formalin-induced behavior reflects activation of C fiber primary afferent nociceptors [5]. This test was in two phases. The response within the first 30 s following formalin injection is the perception of acute pain, while the later period shows chronic pain perception. Frequency of hind paw attention and hind paw licking

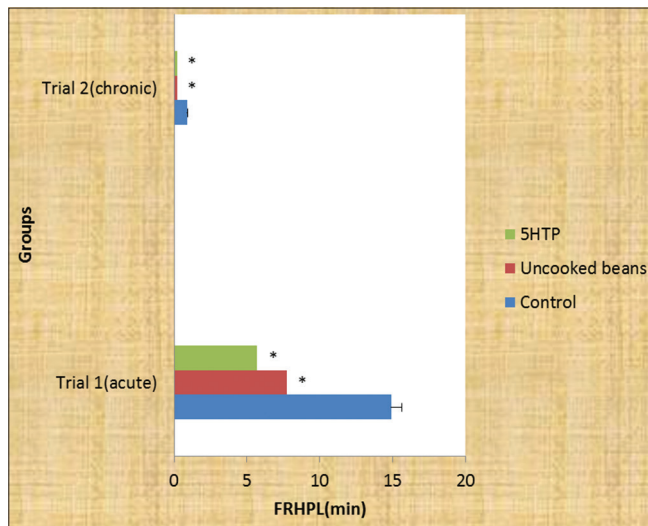


Fig. 1: Right hind paw lick frequency of the different experimental groups after two trials during the assessment of pain using formalin. Values are expressed as mean ± standard error of the mean, n=10,\*p<0.05 versus control

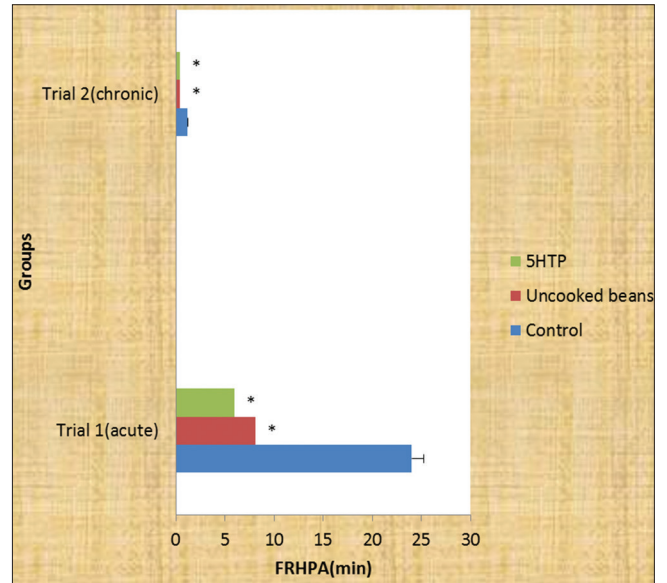


Fig. 3: Frequency of the right hind paw attention of the different experimental groups after two trials during the formalin test assessment for pains. Values are expressed as mean ± standard error of the mean, n=10,\*p<0.05 versus control

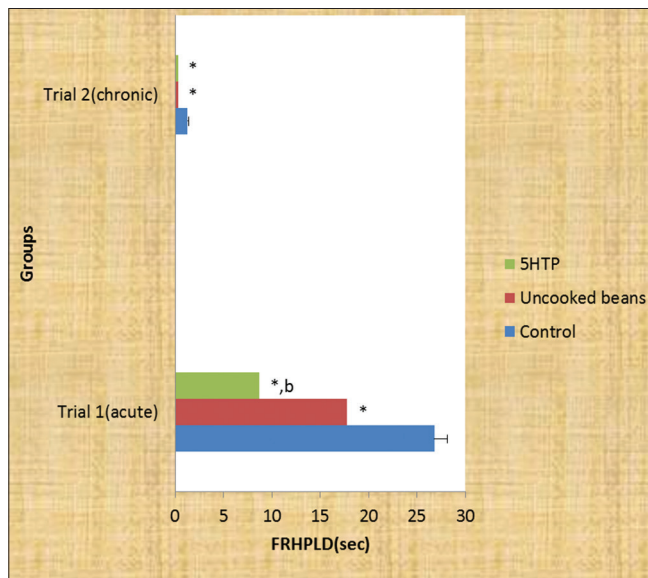


Fig. 2: Right hind paw lick duration of the different experimental groups after two trials during the formalin test assessment for pains. Values are expressed as mean ± standard error of the mean, n=10,\*p<0.05 versus control; b = p<0.05 versus uncooked beans

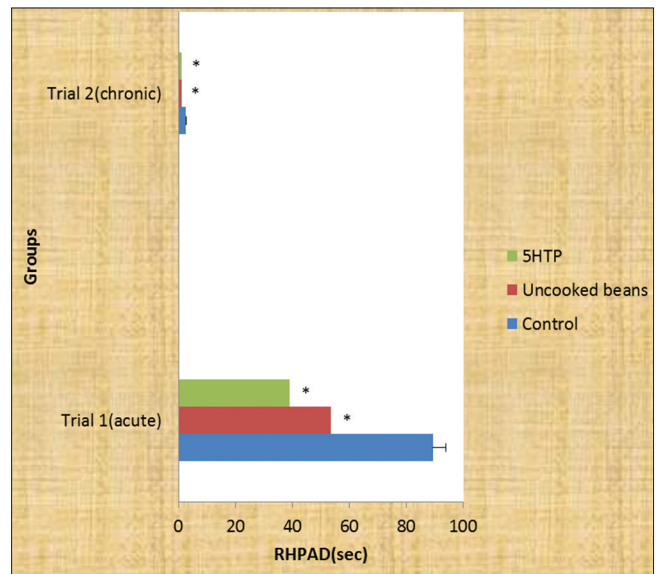


Fig. 4: Right hind paw attention duration of the different experimental groups after two trials during the formalin test assessment for pains. Values are expressed as mean ± standard error of the mean, n=10,\*p<0.05 versus control

following injection with formalin was defined as the number of times the mice licks or shakes their hind paw after injection with formalin. Lower frequencies of hind paw attention and hind paw licking indicate analgesic effect while higher frequencies indicate hyperalgesia. Our finding showed that during acute and chronic phases of pain, the beans diet-fed mice and that of the serotonin precursor fed mice had significantly less pain perception compared to control since the frequencies and durations of hind paw lick and hind paw attention following formalin injection were significantly lower in the beans and serotonin precursor diet-fed mice than the control. Pain reduction was observed in the first and second phases of pain following chronic consumption of beans diet. It is, therefore, interesting to note that beans diet can be beneficial in the reduction of chronic pain if the results in mice can be extrapolated to man. The serotonin circuitry is a well-established pathway involved in brain's analgesia system during transmission of pain in the central nervous system. It is known that the analgesic fibers of this system release neurotransmitter that inhibits pain transmission to the brain, and the neurotransmitters released by the fibers of analgesic pathway are serotonin and enkephalins [8,12]. Our findings suggest that uncooked beans and serotonin precursor diet mice showed less sensitive to pain when compared to those fed with the control diet. Beans diet may decrease pain sensitivity which may also be due to the presence of flavonoids and phlobatannins in the beans which has been reported to reduce pain perception due to their anti-inflammatory properties [4,7]. Finally, uncooked beans diet reduces pain sensation in mice. This may be so because beans contain 5-HTP (serotonin precursor) and 5-HT (serotonin) that play a positive role in the brain analgesia system. The second set of experiments implicated the serotonergic pathway, as the threshold for pain perception was increased in the mice that consumed the serotonin precursor diet.

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#### AUTHORS' CONTRIBUTIONS

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