CHAPTER-VII

Summary And Conclusion
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Armed forces personnel experiences different kinds of stress as a part of day to day activity. The manifestation of stress will aggravate based on the physical conditions of development such as high altitude and desert regions. This prompted us to undertake the present investigation. So that we could provide some food supplement which will reduce the stress level reduces fatigue and enhances performance and at the same time has no unwanted side effects.

1. Screening of different species of Ocimum for anti-fatigue property

Three different species of Ocimum such as O. sanctum, O. gratissimum and O. basillicum were screened for antifatigue activity by feeding the rats with leaf extracts of Ocimum, and making rats to swim with extra load to their body, as similar to the soldier’s heavy work with his luggage. Ocimum sanctum was found to be potent antifatigue plant, the data suggested that O. sanctum (OS) could extend the swimming time, as well as increase the tissue glycogen contents, and decrease the malondialdehyde (MDA), lactate, BUN and serum CK levels. These results also support that Ocimum sanctum at 300mg/kg body weight is the optimum concentration to act against fatigue.

2. Evaluation of anti-fatigue property of the most potent species at different temperatures

The polyphenols and LC-MS analysis of Ocimum sanctum and Ocimum gratissimum showed the presence of bio active components that might be responsible for the antifatigue effect at different temperatures. The data suggests that the leaf extract of O. sanctum at 300 mg/kg bwt. enhances the swimming time to exhaustion of rats with a concurrent increase in glycogen and ATP levels and simultaneous decrease in lactic acid and lipid peroxidation levels at 8°C and 37°C. Whereas a slight
increase in swimming time was observed with *O. gratissimum* at 300 mg/kg body weight supplemented animals exercised at 8°C and 37°C. These results demonstrate that OS-300 is the optimum concentration showing exercise enhancing activity at 37 °C and 8 °C.

3. Anti-stress and neuroprotective studies of *Ocimum sanctum* induced by smoke

The anti-stress and neuroprotective effects of *O. sanctum* against cracker tablet smoke induced damage to rats. The HT TOF-MS analysis of cracker tablet showed the presence of toxic chemicals that might be responsible for tissue damage. The *O. sanctum* hydroalcoholic extract fed rats ameliorated smoke induced blood and serum biochemical alterations. The antioxidant enzyme activities were restored, lipid peroxidation, acetylcholine esterase activity and neurotransmitter levels were regulated with *O. sanctum* supplementation. Further, the lung and brain tissue damage was inhibited and iNOS, HSP-70 and caspase-3 proteins expression was regulated in *O. sanctum* treated rats against smoke challenge as evidenced by histopathology, transmission electron microscope and western blot analysis.

**Oxidative stress on SH-SY5Y cell line**

The antioxidant and neuroprotective effects of *Ocimum sanctum* extract were evaluated at cellular levels. The results demonstrated that *Ocimum sanctum* extract inhibits H$_2$O$_2$ induced neuronal death, ROS generation, lipid peroxidation and DNA damage. The extract restored MMP as well as SOD, CAT enzyme/protein levels and also inhibited HSP-70 over-expression. These data suggests that *Ocimum sanctum* extract may be employed to treat stress induced neurodegeneration.
4. Development of an anti fatigue bar and evaluation of its physicochemical, microbiological, sensory and functional quality characteristics

Proximate composition and the mineral contents were analyzed by ICPOES. The product was stored for 6 months under ambient conditions during which it was stable and acceptable up to 6 months when packed in tri-laminated paper / polyethylene (PFP) pouches. Physico-chemical analysis of *Ocimum sanctum* enriched food bar developed was studied at different interval of time for textural analysis, colour, vapor content, protein content, total calories, peroxide value, free fatty acid and microbial analysis. The sensory evaluation of the product developed showed good overall acceptability. Anti fatigue activity of product developed were assayed. The animals fed with *Ocimum sanctum* enriched bar showed more swimming time when compared to control group in weight loaded force swimming test, similarly the antioxidant enzyme levels SOD, CAT were restored, and decrease in lipid peroxidation, lactic acid, increase in glycogen content were observed in liver and muscle tissue.


The Bruce treadmill test was performed revealed that the *Ocimum sanctum* enriched bar supplementation increases the physical performance of individual by run time. *Ocimum* enriched bar treated group volunteers final VO2max was significantly increased in the final day of the experiment. In *Ocimum* enriched bar supplemented volunteer group, the levels of creatine kinase and lactic acid contents decreased in blood after the treadmill test when compared to control group volunteers. Saliva of the volunteers were screened for the presence of HHV-6 and *Ocimum* enriched bar supplemented group showed absence of viral DNA in almost 50% of the volunteers. All these results put together, clearly indicate that the *Ocimum sanctum* and the enriched bar can be very useful in increasing physical performance in animals as well as humans.