Pak. J. Biochem. Mol. Biol. 2011; 44(3): 110-112

Amelioration of food intake by *Mentha piperita* in restraint rats

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Abstract*: Mentha piperita,* commonly known as peppermint have been used in herbal medicines and food industries for the treatment of various kinds of illnesses. The present study conducted to investigate the effect of *Mentha piperita* on restraint induced decreases in food intake. 2h restraint stress decreased food intake rats. These stress induced deficits in food intake is not observed in the rats treated with *Mentha piperita*. Role of 5-HT in eating behavior is well established. It is observed in the present study that exposure to 2h restraint stress increased brain 5-HT and 5-HIAA levels. Prior administration of *Mentha piperita* leave extract for 5 week decreased 5-HT and 5-HIAA levels. Results are discussed in context of increased 5-HT turns over following repeated administration of *Mentha piperita* in restrained rats.

Keywords: *Mentha piperita*, restraint Stress, food Intake.
Received: June 10, 2011 **Accepted:** August 22, 2011
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INTRODUCTION

The stress-induced behavioral deficits have been demonstrated. Dcreased in 24-h food intake during and after repeated restraint stress has been reported[1-3]. Weight loss induced by repeated restraint appears after first stress session and the rats continue to lose more weight with each exposure to peppermint oil can be used to treat asthma, headaches, colds, cramps, eliminates apathy and nervous stress, etc[4].

The combination of peppermint oil, eucalyptus oil and ethanol increased cognitive performance and had a muscle-relaxing and mentally relaxing effect[5,6]. Stress is an important impetuous factor in depression[7]. It has been previously reported that behavioral changes occur after exposure to inevitable stress[8]. Episodes of 2h restraint stress produced great loss of appetite in rats[9,10].

A variety of herbal preparations and drugs act either by central mechanism or by peripheral mechanism that increases thermogenesis in adipose tissues. In present study effect of repeated administration of *Mentha piperita* on restraint induced decreases in food intake is monitored.

MATERIALS AND METHODS

Animals

Locally bred albino Wistar rats weighing 150-250g purchased from the animal house Karachi University, Pakistan were housed individually in cages and divided into control and test groups. Animals of test group were administered by peppermint extract and the animals of control group were administered by water. All experiments were performed according to a protocol approved by the local Animal Care Committee.

Experimental Protocol

In the beginning of experiment animals were divided equally onto tape water and peppermint extract (0.1gm /kg). The animals were administered about 250ml twice in a week till the end of the experiment. Food intake and body weight of all rats were measured once in a week.

After 5 weeks peppermint administration animals were further divided into unrestrained and restrained sub-groups. Animals of restrained groups were restrained for 2 h. The animals assigned for unrestrained groups were left to their home cages. 24 h following the stress animals were decapitated. Brain samples were collected and stroe at -70^{o}C which were used for neurochemical analysis by High Performance Liquid Chromatography using EC (HPLC-EC).

Neurochemical Analysis

Concentration of brain 5-HIAA, 5-HT, were estimated by High Performance Liquid Chromatography using EC detector. Samples were extracted as described earlier[8]. A 4µm Novapak ODS, 4.6mm i.d.x15cm separation column was used.

The solvent system was methanol (14%), octyle sodium sulphate (0.023%) and EDTA (0.0035%) in 0.1M phosphate buffer. Electrochemical detection was performed at an operating potential of 0.8V (glassy carbon electrode V/S Ag/AgCl reference electrode).

Statistical Analysis

Behavioral and neurochemical data were analyzed by two way–ANOVA. Post- hoc analysis was done by Newman-Keuls test and results are presented as means±SD. P values>0.05 were considered non-significant.

RESULTS

Figure 1 shows the effect of 2hr restraint stress on food intake in water and mint treated rats. Two way ANOVA (df=1, 20) showed significant effect of mint intake on food intake (F=172.8, p<0.01), insignificant effect of stress (F=0.94, P>0.05) and interaction between two factors was significant on food intake (F=14.1, p<0.01).

Post-hoc analysis by Newman-keuls test showed that 2h restraint stress significantly decreased (p<0.01) food intake in mint and water treated rats, but these decrease levels are significantly low (p<0.01) in mint treated restraint rats compared to water treated restraint rats.

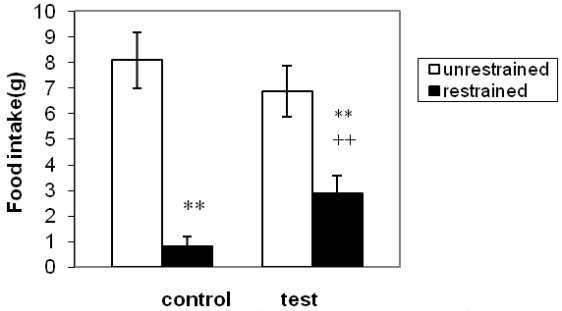

Figure 1: shows the effect of 2hr restraint stress on food intake in water and mint treated rats. Values are mean±SD (n=6). Significant differences by 2 way ANOVA *p<0.01

Figure 2 shows the effect of 2hr restraint stress on 5-HT levels in whole brain of water and mint treated rats. 2 way ANOVA (df=1, 20) showed significant effect of mint intake on 5-HT levels in whole brain (F=81.52, p<0.01), significant effect of stress (F=15, p<0.01) and significant interaction between two factors (F=743.1, p<0.01).

Post-hoc analysis by Newman-keuls test showed that the restraint stress significantly increased (p<0.01) 5-HT levels in whole brain in water treated rats but significantly decrease (p<0.01) in mint treated rats.

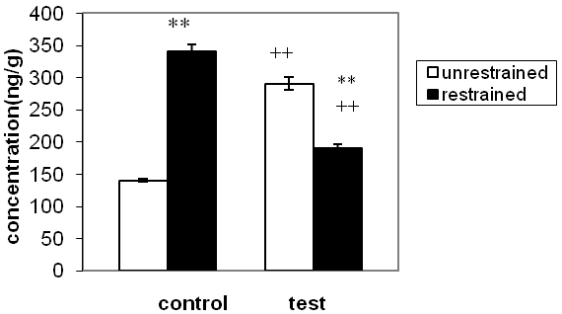

Figure 2: shows the effect of 2hr restraint stress on 5-HT levels in whole brain of water and mint treated rats. Values are mean±SD (n=6). Significant differences by 2 way ANOVA *p<0.01

Figure 3 shows the effect of 2hr restraint stress on 5HIAA levels in whole brain of water and mint treated rats. Two way ANOVA revealed significant effect of mint intake on 5HIAA levels (F=966.8, p<0.01), significant effect of stress (F=78.3, p<0.01) and significant interaction between stress and mint intake on 5HIAA levels in whole brain (F=135.2, p<0.01).

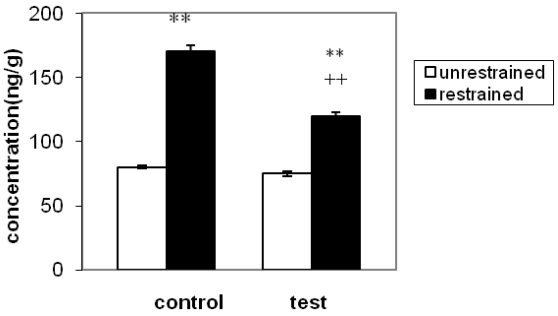

Figure 3: shows the effect of 2hr restraint stress on 5HIAA levels in whole brain of water and mint treated rats. Values are mean±SD (n=6). Significant differences by 2 way ANOVA *p<0.01

Post-hoc analysis by Newman-keuls test showed that the restraint stress significantly increased (p<0.01) 5HIAA levels in whole brain in water treated rats as well as significantly increase (p<0.01) in mint treated rats.

DISCUSSION

There is a complex relationship between central and peripheral factors for the regulation of food intake these central and peripheral components of weight control are mediated by several neurotransmitters. A variety of herbal preparations and drugs act either by central mechanism or by peripheral mechanism that increases thermogenesis in adipose tissues. In present study effect of repeated administration of *Mentha piperita* on restraint induced decreases in food intake is monitored. Stress is an important etiological factor in depression. Studies show that uncontrollable stress procedures produce neurochemical and behavioral changes. Inhibition of restraint induced[11] anorexia by the administration of 5-HT precursor tryptophan has been reported[12]. In present study the effect of commonly used herb Mentha Piperita on restraint induced eating behavior was investigated. It is observed in the present study that 2h restraint stress significantly decreased food intake. These stress induced deficits in food intake were not observed in rats treated with *Mentha piperita*. However the repeated administration of

mint leaves extract increases food intake in restraint animals when compared with water treated restraint rats.

Role of 5-HT in regulation of eating behaviors has been well established[13]. Classical hypothesis describes 5-HT as anorexiogenic compound. Drugs increasing extracellular 5-HT by releasing or inhibiting 5-HT reuptake have been shown to reduced food intake[14]. On the other hand drugs inhibiting the firing rate of 5-HT neurons have been shown to increase food intake[15]. It is also reported that food restriction decreases serotonin levels and its synthesis rate in hypothalamus[16], Increased levels of 5-HT and 5-HIAA following 2h restraint stress observed in present study.

These stress induced increases in 5-HT and 5-HIAA levels are significantly decreased in test animal treated with *Mentha piperita*. Decreased 5-HT and increased 5-HIAA levels were observed in mint treated restraint rats. Increased levels of 5-HIAA is often taken as measure of increased 5-HT turnover. Increased 5-HIAA levels were observed following 2h restraint stress in control as well as in mint treated rats mint treated rats. These increases are more in water treated rats as compared to mint treated rats. Decreased 5-HT and increased 5-HIAA levels together with the increase in restraint induced decrease in food intake in mint treated rats suggests possible role of 5-HT turnover in eating behavior following repeated administration of *Mentha piperita*.

CONCLUSION

In conclusion it is suggested that increased 5-HT turnover following repeated administration of *Mentha piperita* may be involve in the attenuation of stress induced decreases in food intake.

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