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## **CHEMOPREVENTIVE EFFECTS OF SOYBEAN (*GLYCINE MAX*) IN MOUSE MODEL SYSTEM**

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**ABSTRACT:** Cancer is one of the rapidly growing diseases, which is now second leading cause of death. Our preexisted therapeutics has very little effect with higher range of side effects. Chemoprevention is a novel strategy which is currently based on the herbal drugs which have chemo-protective potentials. Our research work is based on the phytochemicals present in the plant which could reverse or suppress tumor growth. In present investigation we selected *Glycine max* (Soybean) to evaluate its anti-cancerous effects. We evaluated hepatic antioxidant profile and revealed that use of different doses of *Glycine max* work over GSH, Catalase activity meanwhile effect on lipid peroxidation reveal that lipid peroxidation was significantly decreased with higher doses of *Glycine max*. Our findings clearly suggest that *Glycine max* can significantly suppress or reverse tumor formation by increasing the activity of antioxidant enzymes and lipid peroxidation could be reversely altered.

**KEYWORDS:** Chemoprevention, *Glycine max*, Antioxidant enzyme assay

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### **INTRODUCTION:**

Our body is made up of billions of cells; many of these cells grow, divide, differentiate and then die in a predictable manner. Cancer occurs when something goes wrong with this system, causing uncontrolled cell division and growth. Cancer Chemoprevention was first introduced by Dr.



Michael Sporn in 1976. It is well established that primary prevention is the most effective means of disease control. This is particularly true for cancer. It was defined as the utilization of chemically active compounds to reverse, suppress or prevent progression of disease from pre-invasive cancer to frank malignancy. It has been shown that a large number of naturally occurring compounds from vegetables and fruits are effective as chemopreventive agents. *Glycine max* is one of the plant used to investigate its chemopreventive action in present investigation.

## MATERIALS AND METHODS:

Random bred Swiss albino male mice (6 weeks old) were used for study. The animal care was in accordance with the "Principles of Laboratory Animal Care" of the National Institute of Health (USA) and under strict adherence with the Indian Animal Ethics Committee (IAEC) guidelines. The mice are divided into eight groups each containing 6 mice ( $n = 6$ ) as shown below. All groups were routinely observed and body weight of mice was recorded. The mice of DMBA-treated groups were shaved 48 hrs before DMBA treatment to remove the hairs from the dorsal surface.

Group	Feeding and Treatment
Group No. 1 (n=6)	Control Group treated with DMBA
Group No. 2 (n=6)	Control Group treated with acetone only
Group No. 3 (n=6)	Low dose of soybean (2.5%) diet plus DMBA
Group No. 4 (n=6)	Low dose of soybean (2.5%) diet only
Group No. 5 (n=6)	Middle dose of soybean (5%) diet plus DMBA
Group No. 6 (n=6)	Middle dose of soybean (5%) diet only
Group No. 7 (n=6)	High dose of soybean (7.5%) diet plus DMBA
Group No. 8 (n=6)	High dose of soybean (7.5%) diet only



## **BIOCHEMICAL ESTIMATION :**

The inducibility of drug metabolizing enzymes is one of the reliable biochemical markers to assess the chemopreventive potential of a test compound (Prochaska and Fernandes 1993; Banerjee and Rao 1995; Shijun *et al.*, 2000). We selected liver and kidney (extra hepatic Organ) because the liver plays the pivotal role of carrying out various important reactions including xenobiotic metabolisms (Omura and Takasue 1970). Catalase assay was performed by the method of Aebi (1984). The procedure described by Moron *et al.*, (1979) was used for estimating the level of acid soluble sulfhydryl group. Lipid peroxidation in microsomes prepared from liver, was estimated spectrophotometrically by thiobarbituric acid-reactive substance (TBARS) method as described by Varshney and Kale (1990) and is expressed in terms of malondialdehyde (MDA) formed per mg protein.

## **RESULTS:**

In the present study chemopreventive action of different doses of *Glycine max* has been studied in liver. To understand the mechanism of action of *Glycine max*, the following biochemical parameters were studied.

## **ANTIOXIDANT FUNCTION:**

The antioxidant potential was determined in terms of the level of reduced glutathione (GSH), and catalase (CAT) activity. Only DMBA treatment group showed a slight decrease in GSH level as well as CAT activity when compared to their basal control levels. The elevation of the specific activities of GSH has been seen with all doses (DMBA-treated and -untreated groups). The elevation has been seen by 1.17 ( $p < 0.05$ ) fold with DMBA treated low dose soybean group while DMBA-untreated low dose showed 1.25 fold ( $p < 0.005$ ) increase. DMBA-treated medium dose showed an increase of 1.18 fold ( $p < 0.05$ ) while without DMBA-treated medium dose shows 1.35 fold ( $p < 0.05$ ) DMBA-treated high dose showed 1.23 fold ( $p < 0.05$ ) elevation and high dose (without DMBA-treated) showed an elevation of 1.56 fold ( $p < 0.001$ ). CAT activity shows significant increase of 1.24 fold ( $p < 0.05$ ) with medium dose (without DMBA treatment) whereas the inducibility by the higher dose (without DMBA treated group) was 1.38 fold ( $p < 0.005$ ), the

remaining groups also showed gradual increase in the level of enzyme activity with respective dose group as compared to the basal control level of these enzymes. Level of lipid peroxidation, in terms of the formation of malondialdehyde (MDA) was found to be effectively inhibited at each dose of treatment with *Glycine max*. Only DMBA treatment group showed a slight increase in lipid peroxidation as compared its basal control level. Lipid peroxidation was reduced by 0.51 fold ( $p < 0.05$ ) with high dose (not treated with DMBA) of *Glycine max*, other dose groups also showed the decrease in lipid peroxidation level but values was not significant.

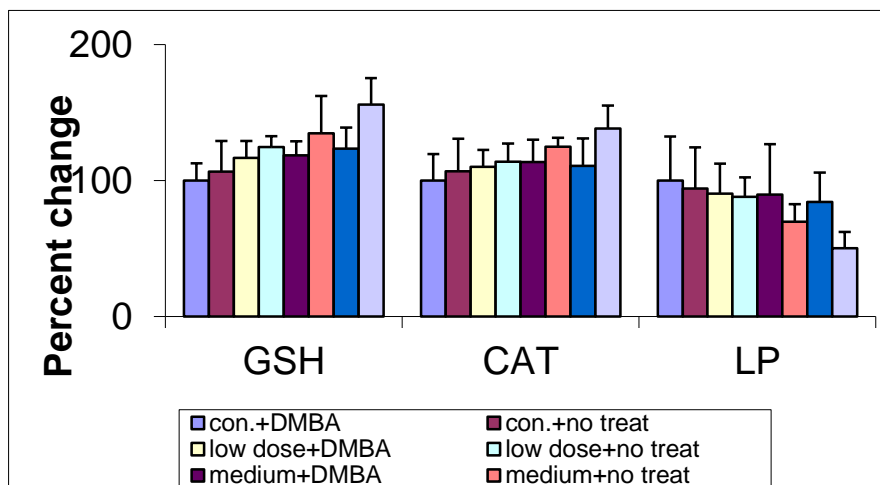
**Table: Modulatory influence of different doses of *Glycine max* on hepatic antioxidant related parameters in mice.**

Groups & Treatments	GSH	CAT	LP
Control DMBA Treated	3.075±0.391 (100)	27.286±5.303 (100)	2.399±0.779 (100)
Control Without DMBA	3.280±0.687 (106.66)	29.165±6.562 (106.88)	2.257±0.727 (94.08)
<i>Glycine max</i> Low dose + DMBA	3.590±0.383 <sup>a</sup> (116.74)	30.036±3.377 (110.08)	2.167±0.529 (90.33)
<i>Glycine max</i> Low dose	3.832±0.248 <sup>c</sup> (124.61)	31.089±3.620 (113.94)	2.112±0.343 (88.04)
<i>Glycine max</i> Med. dose + DMBA	3.643±0.318 <sup>a</sup> (118.47)	30.976±4.512 (113.52)	2.152±0.887 (89.70)
<i>Glycine max</i> Med. dose	4.141±0.845 <sup>a</sup> (134.67)	34.042±1.841 <sup>a</sup> (124.76)	1.672±0.311 (69.70)
<i>Glycine max</i> High dose + DMBA	3.794±0.480 <sup>a</sup> (123.38)	31.672±5.759 (110.74)	2.019±0.518 (84.16)
<i>Glycine max</i> High dose	4.791±0.601 <sup>d</sup> (155.80)	37.751±4.606 <sup>c</sup> (138.35)	1.205±0.287 <sup>c</sup> (50.23)

Values are expressed as mean ± SD of 6-8 animals, Values in parentheses represent relative change in parameters assessed, <sup>a</sup> ( $p < 0.05$ ), <sup>b</sup> ( $p < 0.01$ ), <sup>c</sup> ( $p < 0.005$ ) and <sup>d</sup> ( $p < 0.001$ ) represent significant changes against control

① nmole GSH/g tissue, ② specific activity expressed as μmole/mg protein, ③ μmole H<sub>2</sub>O<sub>2</sub> consumed/min/mg protein, ④ μmole/mg protein.

Abbreviations- GSH: reduced glutathione, CAT: catalase, LP: lipid peroxidation



Effect of different doses of *Glycine max* on the hepatic phase I enzyme activities in mouse with or without DMBA treatment.

**DISCUSSION:**

The burden of preventable suffering and death from cancer throughout the world is huge. Some of the cancers now most common in Europe, North America and Australasia are known to be largely preventable. Changes in society worldwide are accelerating and are liable, if unchecked, to increase the burden of cancer, most of all in Africa, Latin America and Asia. There are an estimated 2.5 million cases of cancer in India at any given time. The two most common cancers among Indian women are those of the cervical and breast. Worse, yet, more than 70% of all cancers in India are found when the disease is advanced in such stages that treatment is either much less effective or ineffective (ICMR Report 2005).

With reference to antioxidant enzyme status in the liver, almost all the studied antioxidants-related enzymes and parameters, including GSH and catalase that play an important role in the antioxidant enzyme defense system. Catalase activity has been augmented by *Glycine max* which can help in removing hydrogen peroxide produced by different biochemical reaction in our body like  $\beta$ -oxidation of fatty acids that may release hydrogen peroxide which is highly unstable and broken down into water and ROS. The ROS is highly reactive and can react with DNA and cause DNA damage. Antioxidant plays crucial role in entrapping the ROS and preventing its damaging effect on macromolecules of cell. The lipid peroxidation is an indicator of oxidative stress that persists



in the cell after exposure to the agents causing oxidative damage. Reduced glutathione participates in spontaneous scavenging of electrophiles or free radicals. DMBA decreased the basal level of GSH as well as catalase which were prevented by the soybean in both the organs, the liver and kidney, indicating its strong antioxidant potential. Our present investigation demonstrated clearly that *Glycine max* can be used as a potential cancer chemopreventive agent by virtue of its efficacy. It also protects against oxidative stress via the elevation of antioxidative defense enzymes involving GSH and catalase, while significantly reducing the lipid peroxidation.

## REFERENCES:

Aebi H. (1984) "Catalase in vitro". In: Methods in enzymology, vol 105, S.P. (eds Colowick, Kaplan NO): 121-126 Academic Press, New York.

Banerjee S, Welsch CW, Rao AR. (1995) Modulatory influence of camphor on the activities of hepatic carcinogen metabolizing enzymes and the levels of hepatic and extrahepatic reduced glutathione in mice. *Cancer Lett.* 1995 Jan 27;88(2):163-9.

Moron MA, Depierre JW, Mannervick B (1979) Levels of glutathione, glutathione reductase and glutathione S-transferase activities in rat lung and liver. *Biochim Biophys Acta* 582(95): 67-78

Omura T, Takasue S (1970) A new method for simultaneous purification of cytochrome [b.sub.5] and NADPH-cytochrome c reductase from rat liver microsomes. *J Biochem* 67(14): 249-257

Prochaska and Fernandes 1993 Elevation of serum phase II enzymes by anticarcinogenic enzyme inducers: markers for a chemoprotected state? *Carcinogenesis.* 1993 Dec;14(12):2441-5.

Shijun Li, Tao Yan, Ji-Qin Yang, et al (2000). The role of Cellular Glutathione Peroxidase Redox Regulation in the Suppression of Tumor Cell Growth by Manganese Superoxide Dismutase. *Cancer Res*, 60(13); 3927-39.

Varshney R and Kale R K. Effect of calmodulin antagonists on radiation induced lipid peroxidation in microsomes. *International Journal Radiation Biology* 1990, 58(5): 733- 743.