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Original Article

ETHANOLIC EXTRACT OF NARDOSTACHYS JATAMANSI POTENTIATES HAEMATOPOIETIC SYSTEM IN ALBINO WISTAR RATS

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Abstract :

Background and Objective: The consumption of a variety of local herbs and vegetables by man contributes significantly to the improvement of human health in terms of prevention, and/ or cure of diseases because plants have long served as a useful and natural source of therapeutic agents. The present study aims at investigating the hematopoietic effect of Nardostachys jatamansi extract (NJE) in albino wistar rats.

Materials and Methods: Twenty four male albino wistar rats were used and divided into 4 groups of 6 animals each. The Group I served as a normal control. The animals of Group II, III and IV were administered orally with aqueous suspension of NJE at the dosage of 100 mg/kg, 200 mg/ kg and 400 mg/kg body weight for 15 consecutive days respectively. Then blood was Blood was collected and used for the estimation of Peripheral blood counts (RBC, WBC), haemoglobin, thrombocyte count and Hematocrit was determined at day 0.25 (6 hrs), 0.5 (12 hrs), 1, 2, 5, 10, and 15 days of treatment using automated haematology analyzer. Body weight was also recorded regularly. Statistical Analysis was done by one way ANOVA followed by Bonferroni post hoc test for multiple comparisons using SPSS-16. P value less than 0.05 was considered the level of significance.

Result: All the parameters have shown a significant increase (p=0.000) in experimental animals except body weight which was increased insignificantly.

Conclusion: Nardostachys jatamansi extract can be attributed to stimulating or protecting hematopoiesis.

Keywords – Nardostachys jatamansi, Peripheral Blood Counts, Haemoglobin, Thrombocyte Count, Hematocrit.

Introduction :

India has been using its rich biodiversity in the healthcare segment for many years. Its rich traditional experience and wisdom is ensconced in the Ayurveda and Siddha systems of medicine. The uninterrupted use and the popularity of herbal formulations for thousands of years and the belief that Ayurvedic medica could be a viable resource for modern drug development has been a strong incentive for the Research and Development into the herbal wealth of Ayurveda. Traditional medicine is one of the common forms of therapy across the world.

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It is generally known that the consumption of a variety of local herbs and vegetables by man contributes significantly to the improvement of human health, in terms of prevention, and or cure of diseases because plants have long served as a useful and natural source of the therapeutic agents. According to WHO, about three quarters of the world's population use herbs and other forms of medicine in treatment of various ailments. It is estimated that approximately 1000 herbal formulations

prepared from 750 plants are in regular use at the present time[1].

With the shifting of attention from synthetic drugs to natural plant products, the use of plant extracts for enhancing growth performance in animals is now in the increase. Plants that were once considered of no value are now being investigated, evaluated and developed into drugs with little or no side effects[2].

One such plant is Nardostachys jatamansi, a medicinal herb belongs to the family Velirenaceace of plant taxa has been extensively described in Ayurvedic literature. The bitter tonic obtained from the rhizomes of the Jatamansi, also called Bhutajata, Jathilaa, Thapaswini can be used as a neuroprotective, sunscreen, stimulant, antispasmodic, repellent, antipyretic, antioxidant, as well as to treat herpes infection, leprosy, various neuropsychiatric illnesses, and excessive thirst"[3,4]. It also has other Ayurvedic applications such as in complexion, strength, kidney stones, jaundice, removes blood impurities, spasmodic hysteria and other nervous convulsive ailments; heart palpitations, nervous headache, flatulence, epilepsy, convulsions, respiratory and digestive diseases, skin diseases, typhoid, gastric disorders, seminal debility[5]. Within the recent decade, a good number of medicinal plants have been reported to be employed in folk medicine in the treatment of anemia. Among these plants include Telfeira occidentalis, Combretum dolichopetalum, Allinu assalonicum, Bougainv spectabilis, Psorospermum ferbrifugum, Sorghum bicolor, Jatropha curcas, Flacourtia flavenscens and Ageratum conyzoides[6-12].

As a result of the prevalence of different forms of parasitic infections, anemia is one of the clinical conditions that constitute a serious health problem in many tropical countries, including malaria[13]. Anemia is characterized by a decrease in the level of circulating hemoglobin[14]. In the tropical region due to endemicity of malaria and other parasitic infections, between 10 to 20% of the population is reported to possess less than 10 g/dl of Hb in the blood[15]. The determination of hematological indices provides physiological information on a proper blood assessment. According to Okonkwo et al[16], accurate laboratory determination of blood parameters remains the only sensitive and reliable foundation for ethical and rational research, diagnosis, treatment and prevention of anemia. The major concern of the scientific communities with regard to medicinal plants and hematological studies focuses on the measures that can maintain a normal hematological state of being and reverse any negative hematological status associated with various anemic conditions. Therefore, in the present study we have attempted to evaluate the hematopoietic effect of Nardostachys jatamansi in albino wistar rats.

Materials & Methods:

Animals:

Male albino rats of 2 months old weighing 150±20 gm body weight were used for the present study. The animals were fed with standard rat feed, with free access to water ad libitum and are maintained under well ventilated condition of 12 hour light and dark cycle (Temperature 24-28 °C, relative humidity 60-70%). They were kept in standard polypropylene cages with husk shavings as bedding and were adapted to laboratory condition for 7 days prior to the Whole body electron beam irradiation. Animals were randomly assigned to cages as n= 6 in each group and individual animal was fur marked with Indian ink for easy identification. All the experiments were performed during the same time of the day. The experimental protocol was approved by Institutional Animal Ethics Committee.

Preparation of the extract and mode of administration:

Extract of N. jatamansi root was prepared by extracting 100 grams of Jatamansi powder (Indian Remedies, India) in 90 % ethanol (1L) at 50 °C to 60 °C in a Soxhlet extractor for 72 hours. The cooled liquid extract was concentrated by evaporating its liquid contents in rotary evaporator, with an approximate yield of 20 %. The dried ethanol extract was suspended in distilled water. The drug, N. jatamansi root extract (NJE) was administered orally once daily at the dosage of 100 mg/kg, 200 mg/ kg and 400 mg/kg body weight for 15 consecutive days respectively.

Keywords – Nardostachys jatamansi, Peripheral Blood Counts, Haemoglobin, Thrombocyte Count, Hematocrit.- Damodara Gowda K.M

Experimental design:

In the present study, 24 male albino wistar rats were used and were randomly divided into 4 groups of 6 animals each. The Group I served as a normal control. They were fed with normal diet and double distilled water, DDW. The animals of Group II, III and IV were administered orally with aqueous suspension of NJE at the dosage of 100 mg/kg, 200 mg/ kg and 400 mg/kg body weight for 15 consecutive days respectively.

Determination of Haematological Parameters:

Blood was collected from the tail vein of each animal in a vial Containing 0.5M EDTA. Peripheral blood counts (RBC, WBC), haemoglobin, thrombocyte count and Hematocrit percentage was determined at day 0.25 (6 hrs), 0.5 (12 hrs), 1, 2, 5, 10, and 15 days of treatment using automated haematology analyzer (Sysmex Co., F-820,Japan).

Statistical Analysis:

Values are expressed as Mean ± S.D. Statistical Analysis of data for significant variation among the different groups were done by one way ANOVA followed by Bonferroni Post -Hoc Tests for Multiple Comparison among the groups was performed using SPSS and the P value less than 0.05 was considered the level of significance.

Result :

The results of the present study were represented in figure 1 to 6. The body weights of the experimental animals were recorded at day 1, 2,5,10 and 15 during the administration of different dosages of NJE and when compared with control showed an insignificant increase in treated rats (Fig-1).

The haematological parameters were assessed at day 0.25 (6 hrs), 0.5 (12 hrs), 1, 2, 5, 10, and 15 days of administration of NJE. The haemoglobin concentration among the rats treated with different dosages of NJE was highly significant (p=0.000) and between control and treated rats at day 5, 10 and15 was also significant (p=0.044, 0.028 and 0.005 respectively at the end of day 15 (Fig-2). The RBC Count in rats treated with different dosages of NJE was increased significantly (p=0.000) when compared with control (Fig-3). The variation in WBC Count among control and rats treated with 200mg and 400 mg of NJE/ kg bodyweight was increased significantly (p=0.000) at the end of day 15(Fig-4). The Hematocrit percentage in rats treated with different dosages of NJE has shown a significant increase (p=0.000) as compared with control rats. But, the increase among the animals treated with 200mg and 400mg/kg bodyweight was insignificant (Fig-5). The comparison of Platelet count in rats treated with 100mg/kg body weight was insignificant when compared with control. Whereas, the Platelet count in rats treated with 200mg and 400mg/kg bodyweight was significantly increased (p=0.000, Fig-6).

Discussion :

There is a continual interest worldwide to screen for non-toxic hematoprotectors that can be used against harmful effects on hematopoiesis in therapeutic settings for mankind. Despite extensive work done in this field, not a single compound has emerged so far as an effective non-toxic hematopoietic booster for practical purposes. Indications of blood transfusion includes Anaemia, Major Surgical Operation, Accidents resulting in considerable blood loss, Cancer patients requiring therapy, Women in childbirth and newborn babies in certain cases, Patients of hereditary disorders like Haemophilia and Thalassaemia, Severe burn victims etc. Therefore, screening of natural products of plant origin represents a major avenue for the discovery of new drugs. In this study, we have attempted to evaluate the hematopoietic effect of Nardostachys jatamansi in albino wistar rats.

The results of the present study indicated that the extract of Nardostachys jatamansi may possibly serve as an acceptable hematopoietic booster in an anemic condition or prophylactic purpose. Although the specific mechanism through which the extract facilitates the increase in these hematological indices was not understood, this action is assumed to be a direct effect of the extract on the hematopoietic systems. It might be due to the fact that the extract contains such constituents that can interact and stimulate the formation and secretion of erythropoietin, hematopoietic growth factors[17].

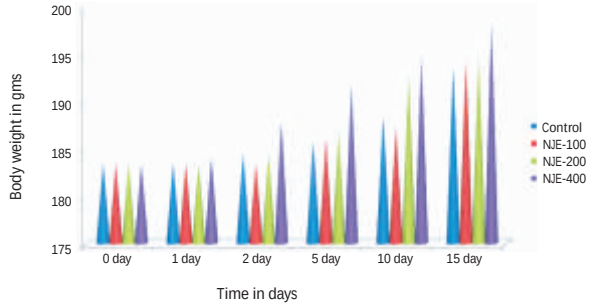

Fig.1: Comparison of Body weight in rats treated with different of NJE with control. The difference body weight between control and treated rats and among the groups were insignificant

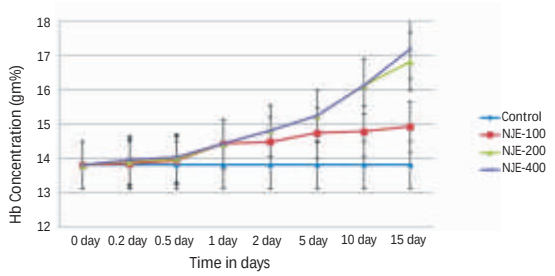

Fig.2: Comparison of Hemoglobin level in rats treated with different dosages of NJE with control. P value between the different group was highly significant (p=0.000) whereas, between control and treated rats at day 5, 10 and 15 was also significant (p=0.044, 0.028 and 0.005 respectively at the end of day15.

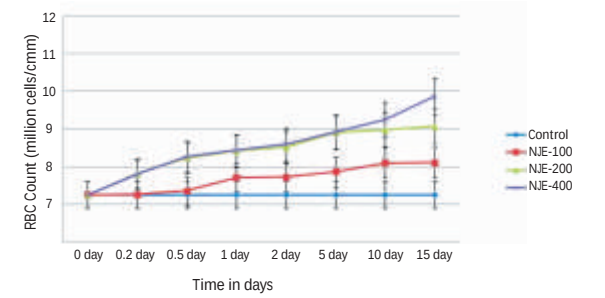

Fig.3: Comparison of RBC Count in rats treated with different dosages of NJE with control. The difference RBC Count between control and treated rats and among different experimental group was highly significant (p=0.000) at the end of day 15.

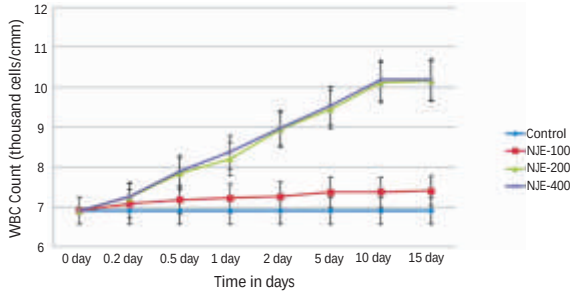

Fig.4: Comparison of WBC Count in rats treated with different dosages of NJE with control. The difference WBC Count among control and rats treated with 200mg and 400 mg/kg body weight was significant (p=0.000) at the end of day 15.

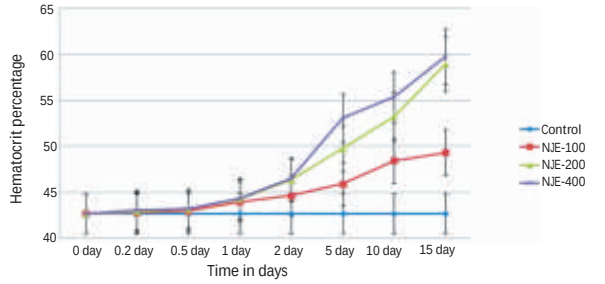

Fig.5: Comparison of Hematocrit percentage in rats treated with different dosages of NJE with control. The difference in Hematocrit percentage among different group was highly significant (p=0.000) Where as, it was insignificant among the animals treated with 200mg and 400 mg/kg body weight.

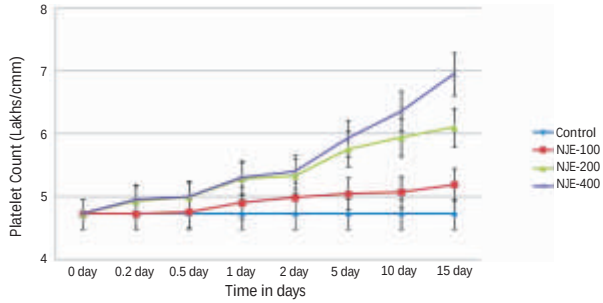

Fig.6: Comparison of Platelet count in rats treated with different dosages of NJE with control. The difference in Platelet count among control and rats treated with 100 mg/kg body weight was significant but, with 200mg and 400mg/kg body weight was highly significant (p=0.000).

Previous research has shown that, prophylactic and therapeutic oral administration of anti-oxidant supplement significantly increases cells of haemopoeitic origin in animals exposed to potentially lethal dose of radiation[18]. Similarly, anti-oxidants such as Vit C, Vit E, succinate and alpha-lipoic have been used to abolish various forms of chemically and metabolically induced oxidative stress to which human haemopoeitic cell lines is exposed[18]. The direct link between anti-oxidant activity and haemopoeitic boosting effect was also demonstrated by the observation that ascorbic acid supplementation, through its action as a free radical scavenger, increased significantly the haemoglobin levels of children suffering from sickle cell anemia[19].

In another study, the methanolic extract of B. koenigii, M. pudica and hexane extract of S. trilobatum induces the RBC count in the embryos of zebra fish and found that active components present in the extract might be inducing the regulation of progenitor cell of the HSC or any regulatory factor for the stimulation of erythrocyte production[20]. Similar studies were carried out by Ekpenyong CE et al (2011) demonstrated that the herbal small molecule present in Garcinia conruana proved to have the potential of influencing the erythropoiesis and influence HSC production which might be effective through an influence on the stimulant cytokine erythropoietin[21]. The mechanism leading to the increase in haematological parameters is probably mediated by the anti-oxidant property of

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Nardostachys jatamansi extract as it has been variously demonstrated by other researchers for other plant extracts. Anti-oxidant property gives the extract the haemopoeitic, protective and stimulating potential.

Conclusion:

This study revealed that the Nardostachys jatamansi can be attributed to stimulating or protecting hematopoiesis in bone marrow and the subsequent increase of haematological constituents in the peripheral blood. Since significant protection is obtained at a non-toxic low dose, NJE may have an advantage over the reported hematoprotectors. Further investigations are warranted to study the exact mechanism of action and clinical applicability of NJE as hematopoietic booster.

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