

# Development of recipes from garden cress seeds and its effect on anaemic patients

RICHA DASHORA AND MADHU CHOUDHARY

**Background:** Anaemia is most common disease prevalent among women. Anaemia is a global public health problem that affects human in all stages of the life. A study was done to see impact of Garden cress seeds (GCS) on the stability of haemoglobin level among young girls. **Methods:** For the study 50 girls were selected from Bhilwara city and their haemoglobin was estimated. Out of 50 girls 10 anaemic (Hb <10 g/dl) girls were selected for intervention test in which garden cress seeds powder (5g) was given to them daily for one month. To see the impact of GCS powder hemoglobin was again estimated after one month. To promote the intake of iron rich Garden cress seeds five recipes were developed and standardized namely cutlet, *Parantha*, *Ladoo*, *Kheer* and biscuit. **Results:** For five recipes the mean score for highly acceptable recipes cutlet, *Parantha*, *Ladoo*, *Kheer*, biscuit was  $17.2 \pm 1.25$ ,  $16.6 \pm 2.17$ ,  $16.4 \pm 2.22$ ,  $16.3 \pm 0.82$ ,  $16.3 \pm 2.11$  respectively. After sensory evaluation Garden cress seeds *Kheer* recipe A (5g), B (10 g) and C (15 g) ranked first, second and third. When different characteristics were compared for t-test it was shown that there was statistically significant difference between A/B and C/A. For garden cress seeds cutlet recipe A (5g), B (10g) and C (15g) ranked first, second and third. There was a statistically significant difference between B/C and C/A. Garden cress seeds *Parantha* recipe A (3g) and B (6 g) marked equal. t-test result showed that there was not statistically significant difference between A/B, B/C, C/A. For recipes *ladoo*, recipe B (5 g) was marked highest (73) and recipe C (7 g) marked lowest (68). For garden cress seeds biscuit recipe A (7 g) marked first (79) recipe B (5 g) and C (3 g) marked equally (70). For recipes *Ladoo* and biscuit there was no significant difference between A/B, B/C and C/A for over all acceptability. Ten girls who consumed garden cress seeds powder their haemoglobin level was significantly increased when estimated after a month. It resulted that garden cress seeds powder was good iron rich product. **Conclusion :** The present study shows that the seeds of Garden cress could be used as food supplement in human diet as it contains considerable amount of iron. Garden cress seeds prepared with the method of soaking in water, milk or coconut water reduces the tanginess and off smell of these seeds.

**Key Words :** Recipes, Garde cress, Anaemic patients

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## INTRODUCTION

Anaemia is a serious public health problem, which affects the mental and physical development. Iron deficiency is by far the most common cause of anaemia worldwide. Garden-cress seeds are used as a medicine in India in the system of "Ayurveda". Also it has health promoting properties which can be used as a functional food. Nutritive value of these seeds is very high. It is

available in almost all parts of the world. This herb is the best source of iron and is hence, recommended in the treatment of iron-deficiency anaemia. It is also rich in folate, calcium, ascorbic acid, tocopherol and beta-carotene. Garden cress seeds are loaded with not just protein, but also linoleic and arachidic fatty acids. People consuming 2tsp/day have seen to have good increased levels of haemoglobin over a period of 1-2 months. The present research is an effort to educate people regarding the use of garden cress seeds in cooking. Recipes made out of these seeds can be an excellent source of iron which can help to combat iron deficiency anaemia among people. The tangy smell can be minimized by soaking, roasting or by powdering it. Even a very small amount if added in recipes can be a remedy for removal of anaemia at very low cost.

**Health benefits of garden cress seeds:**

*For anaemia:*

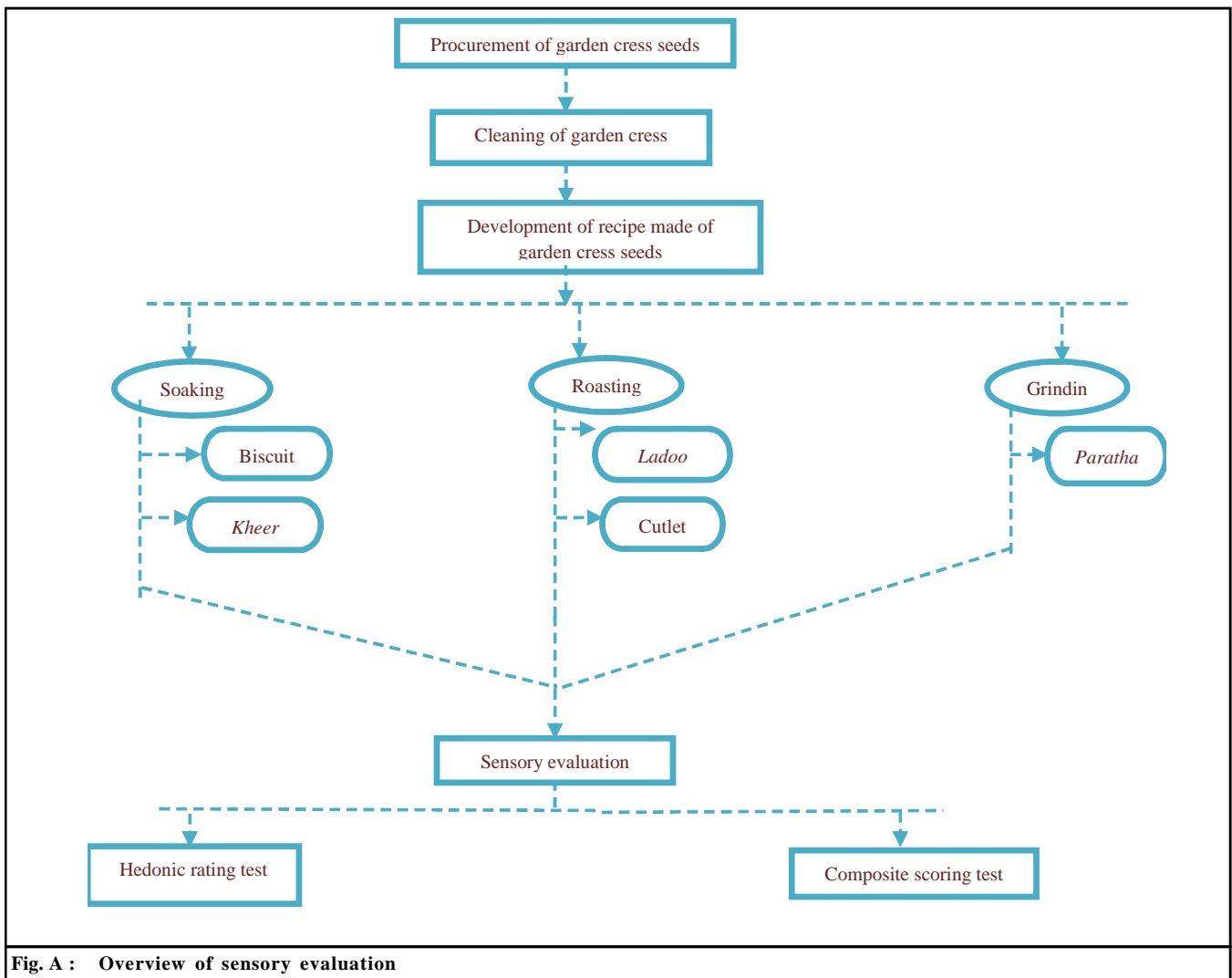
Garden cress seeds being the richest source of non-haeme iron [iron found in haemoglobin which is an easily absorbed dietary iron.] help to increase the haemoglobin levels. When taken regularly, it helps to alleviate anaemia. It is advisable to have vitamin C half an hour after consumption of these seeds as it enhances iron absorption.

*Galactagogue:*

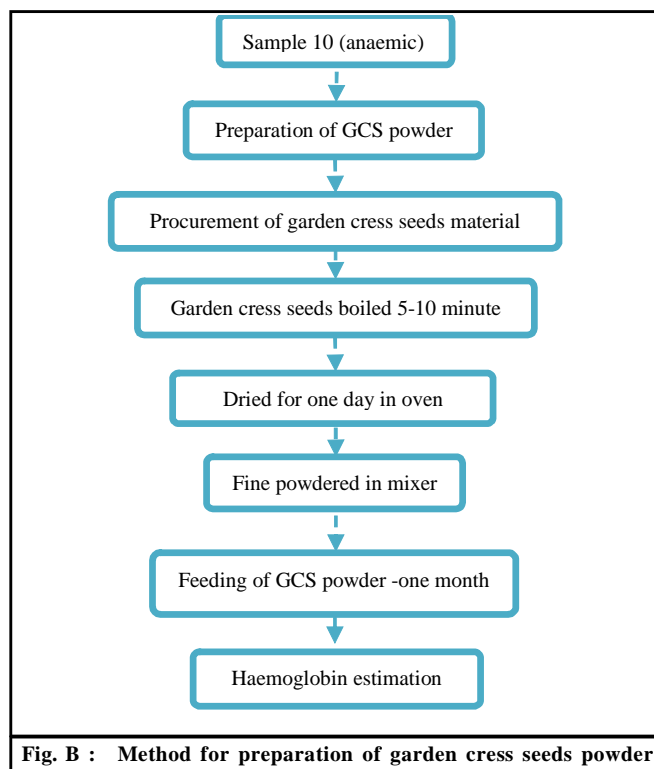
*Kheer* made of garden cress seeds increases milk production and secretion in lactating mothers. Because of its high iron and protein content.

*For the gastro intestinal tract:*

Garden cress helps purify blood and stimulate



**Fig. A : Overview of sensory evaluation**



appetite. It is used during constipation as a laxative and a purgative.

#### For diabetes:

Studies show that seeds of the plant lower the glycemic response to a test meal.

#### For cancer:

Garden cress seeds contain antioxidants like vitamin A and E which help protect cells from damage by free radicals.

#### For other things:

Garden cress seeds are memory boosters because they contain arachidic and linoleic acids. They help gaining lean body mass because they are a good source of iron and protein.

#### Objectives :

- To study the problem of anaemia among girls.
- To study different food product rich in iron.
- To develop iron rich recipes from garden cress seeds.
- To evaluate acceptability level of the developed recipes by sensory evaluation.

- Feeding of iron rich garden cress seed powder to selected anaemic subjects.

- See the impact of garden cress seeds powder on hemoglobin level of selected sample.

## METHODOLOGY

The locale for the study was Bhilwara city from Rajasthan region. Garden cress seeds were firstly procurement from the local market of Bhilwara. They

**Table A : Ingredients of the recipes**

Ingredients	Recipes A	Recipes B	Recipes C
<b>Garden cress seeds Ladoo</b>			
Garden cress seeds	3 g	5 g	7 g
Jaggery	30 g	30 g	30 g
Coconut powder	50 g	50 g	50 g
Milk	100ml	100ml	100ml
<b>Garden cress seeds nutri Parantha</b>			
Garden cress seeds	3 g	6 g	9 g
Wheat flour	50 g	50 g	50 g
Moong dal	20 g	20 g	20 g
Coriander	5 g	5 g	5 g
Green chill	10 g	10 g	10 g
Onion	10 g	10 g	10 g
oil	15ml	15ml	15ml
<b>Garden cress seeds cutlet</b>			
Garden cress seeds	5 g	10 g	15 g
Potato	100 g	100 g	100 g
Carrot	30 g	30 g	30 g
Green chill	10 g	10 g	10 g
Coriander	5 g	5 g	5 g
Corn flour	15 g	15 g	15 g
Bread crumbs	15 g	15 g	15 g
Onion	20 g	20 g	20 g
Oil	15ml	15ml	15ml
<b>Garden cress seeds biscuit</b>			
Garden cress seeds	7 g	5 g	3 g
Refined flour	40 g	40 g	40 g
Semolina	10 g	10 g	10 g
Gram flour	25 g	25 g	25 g
Butter	50 g	50 g	50 g
Sugar	60 g	60 g	60 g
<b>Garden cress seeds Kheer</b>			
Garden cress seeds	5 g	10 g	15 g
Milk	100ml	100ml	100ml
Ghee	2.5 g	2.5 g	2.5 g
Sugar	10 g	10 g	10 g
Water	125ml	125ml	125ml

were firstly cleaned to make use for cooking. Five recipes were developed namely, Garden cress seeds laddoo, Garden cress seeds nutri paratha, Garden cress seeds cutlet, Garden cress seeds biscuit, Garden cress seeds Kheer by using different proportion by the traditional method of cooking. Sensory evaluation was done of those five recipes with the help of hedonic scale and composite scoring test.

For pre-intervention garden cress seeds powder was prepared. 5g garden cress seeds powder was given to ten volunteers (anaemic people haemoglobin less than 10mg/dl) for one month. After one month haemoglobin test was done of all ten anaemic people.

### OBSERVATIONS AND ASSESSMENT

In the present study, recipes were prepared with

garden cress seeds in different proportions. Sensory evaluation by hedonic scale test it was revealed that recipe A ranked first and B ranked second for *Kheer*. Recipe A and B were ranked first and second, respectively for cutlet. Recipe A, B ranked equal and C ranked lowest for *Parantha*. For *Ladoo* recipe B ranked first and C ranked third. Recipe B, C ranked equal and A ranked

**Table 1 : Total score by hedonic scale**

Recipes	Rating by hedonic scale		
	A	B	C
<i>Kheer</i>	80 (5 g)	65 (10 g)	50 (15 g)
Cutlet	80 (5 g)	76 (10 g)	66 (15 g)
<i>Paratha</i>	75 (3 g)	74 (6 g)	67 (9 g)
<i>Ladoo</i>	71 (3 g)	73 (5 g)	68 (7 g)
Biscuit	79 (7 g)	70 (5 g)	70 (3 g)

In bracket indicates the amount of garden cress seeds

**Table 2 : Mean ± SD and “t” value showing all attributes for prepared garden cress seeds recipes**

Attributes	Taste	Appearance	Texture	Mouth feel	Over all acceptability	
<i>Kheer</i> Mean±SD	A	4.15±0.55	3.95±0.35	4±0.44	4.2±0.4	16.3±0.82
	B	3.5±0.84	3.55±0.49	3.4±0.51	3.2±0.42	13.65±1.56
	C	3±0.87	3.2±1.08	3.2±0.78	2.7±0.67	11.66±2.76
t-test	A/B	2.62*	2.52*	2.82*	5.54	5.09*
	B/C	2.29*	1.67*	1.00NS	4.00*	2.12NS
	C/A	5.07*	2.63*	3.46*	8.85*	4.54*
Cutlet	A	4.6 ± 0.51	4.4±0.51	4.1±0.99	3.3±1.13	17.2±1.75
	B	3.9±0.73	4±1.03	4.1±0.99	3.3±1.13	15±2.226
	C	2.9±0.99	3.2±1.03	2.9±0.99	2.8±1.13	11.8±3.76
t-test	A/B	3.50*	1.83NS	0.28*	1.94NS	2.12NS
	B/C	4.24*	2.40*	4.24*	1.88NS	3.84*
	C/A	4.43*	3.35*	1.95NS	3.26*	3.53*
<i>Paratha</i>	A	4.1±0.87	4.2±0.63	4.1±0.73	3.9±0.87	16.3±2.71
	B	4.2±0.63	4.2±0.63	4.2±0.63	4±0.66	16.6±2.17
	C	3.6±1.07	3.5±0.84	3.8±0.91	3.7±1.25	14.7±3.62
t-test	A/B	0.35NS	0.00NS	0.00NS	0.42NS	0.27NS
	B/C	1.78NS	2.40*	1.51NS	0.66NS	1.63NS
	C/A	1.47NS	2.40*	1.51NS	0.47NS	1.51NS
<i>Ladoo</i>	A	4.25±0.79	4.2±0.78	3.6±0.84	4.2±0.78	16.25±2.80
	B	4.1±0.73	4.4±0.69	4±0.66	3.9±0.73	16.4±2.22
	C	4.1±0.56	3.8±0.78	3.3±0.82	4.1±0.87	15.3±2.40
t-test	A/B	0.13NS	0.24NS	0.89NS	0.51NS	0.11NS
	B/C	0.42NS	1.15NS	2.00NS	1.41NS	0.64NS
	C/A	0.17NS	0.80NS	2.00NS	0.31NS	0.40NS
Biscuit	A	4.1±0.56	3.9±0.56	4.3±0.67	4±0.66	16.3±2.11
	B	3.9±0.73	3.9±0.73	3.8±0.78	3.7±0.67	15.3±2.31
	C	3.6±1.07	3.7±0.94	3.7±1.15	3.6±1.07	14.6±4.08
t-test	A/B	0.42NS	0.42NS	1.83NS	0.00NS	0.95NS
	B/C	0.61NS	0.00NS	0.00NS	0.28NS	0.24NS
	C/A	1.15NS	0.42NS	1.13NS	0.31NS	1.04NS

\* indicates significance of value at P=0.05, NS=Non-significant

first for biscuit.

The most widely used scale for measuring food acceptability is the 9-point hedonic scale. David Peryam and colleagues developed the scale at the Quartermaster Food and Container Institute of the U.S. Armed Forces, for the purpose of measuring the food preferences of soldiers. The scale was quickly adopted by the food industry, and now is used not just for measuring the acceptability of foods and beverages, but also of personal care products, household products and cosmetics. The hedonic scale was the result of extensive research conducted at the Quartermaster and the University of Chicago. Jones *et al.* (1955) showed that longer scales, upto nine intervals, tended to be more discriminating than shorter scales, and there was some indication that a scale with eleven intervals would be even more effective. The nine-point version became the standard at the Quartermaster, because it fit better on the typing paper used to print the ballots.

This Table 2 shows that for the five recipes the mean score for highly acceptable recipes cutlet, *Paratha*, *Ladoo*, *Kheer* and biscuit were  $17.2 \pm 1.25$ ,  $16.6 \pm 2.17$ ,  $16.4 \pm 2.22$ ,  $16.3 \pm 0.82$ ,  $16.3 \pm 2.11$ , respectively. When the different characteristics and over all acceptability of garden cress seed *Kheer* were compared for t-test it was shown that there was statistically significant difference between A and B, C and A but there was no statistically significant difference between B and C in term of texture and over all acceptability. For garden cress seeds cutlet recipe there was a statistically significant difference between B and C in terms of taste, appearance, texture and over all acceptability and not statistically significant difference in term of mouth feel, when recipe C and A were compared there was statistically significant

difference in taste, appearance, mouth feel and overall acceptability and not statistically significant difference for texture. A and B recipes were compared there was statistically significant difference in taste and texture and not statistically significant difference for appearance, mouth feel, overall acceptability. Garden cress seeds *Parantha* t- test result showed that there was not statistically significant difference between A and B, for all characteristics but B and C, C and A statistically significant for appearance only. Recipes *Ladoo* and biscuit for t- test it was shown that there was not statistically significant difference between A/B, B/C, C/A for all characteristics.

Sensory evaluation is a scientific discipline that analyses and measures human responses to the composition of food and drink, e.g. appearance, touch, odour, texture, temperature and taste. In schools it provides an ideal opportunity for students to evaluate and give feedback on their dishes, test products and experimental designs.

Sensory evaluation can be used to compare similarities/differences in a range of dishes/products evaluate a range of existing dishes/food products analyse food samples for improvements gauge responses to a dish/product, e.g. acceptable v unacceptable explore specific characteristics of an ingredient or dish/food product check whether a final dish/food product meets its original specification provide objective and subjective feedback data to enable informed decisions to be made. Sensory evaluation is important because explore specific characteristics of an ingredient or dish/food product. It check whether a final dish/food product meets its original specification. Sensory tests, of course, have been conducted for as long as there have been human beings evaluating the goodness or badness of food, water and everything else that can be used and consumed (Meilgaard *et al.*, 1999). When a consumer buys a food product, they can buy nutrition, convenience, and image. Nevertheless, most importantly consumers are buying sensory properties/performance and sensory consistency. Therefore, sensory evaluation should be an integral part in defining and controlling product quality. Every company committed to quality should support, develop and operate sensory programme.

### Impact assessment :

Intervention for assess, the acute effect of garden

**Table 3 : Pre and post-intervention compared for t-test**

Sr. No.	Pre- intervention	Post- intervention	t-value
1.	9.4	11.3	t = 7.0205*
2.	9.8	11.8	
3.	8.8	11.6	
4.	10	12.2	
5.	9.4	12	
6.	7.7	9	
7.	9.4	11	
8.	7.4	7.9	
9.	10	11.5	
10.	10	11	
Mean $\pm$ SD	9.19 $\pm$ 0.94	10.93 $\pm$ 1.38	

\* indicates significance of value at P=0.05

cross seeds. Pre and post-intervention was done.

*Pre-intervention:*

For pre-intervention garden cress seeds powder was prepared. For this garden cress seeds were boiled for 5-10 minute than dried for one day in oven then powdered in mixer and made into fine powder. 5g garden cress seeds powder was given to all 10 volunteers (anaemic people) for one month. Powdered garden cress seeds was given 5g (1tsb) daily in the morning by the subjects.

*Post-intervention:*

After one month haemoglobin (HB) test was done of all 10 anaemic people.

The Table 3 mean  $\pm$  SD of haemoglobin levels pre intervention was  $9.19 \pm 0.94$  and for post intervention it was  $10.93 \pm 1.38$ . When pre and post intervention were compared for t-test it was shown that there was statistically significant difference in change of haemoglobin levels among the subjects.

Similar results were seen in a past study which revealed that the mean initial level of haemoglobin in the experimental group was 9.7 g/dl which increased to 10.5g/dl after 3 months of nutrition education by Jyoti and Kasturba (2008). In a further study it was found that a proportion of girls had serum ferritin less than 12  $\mu$ g/ml, indicative of poor iron storage by Kotecha *et al.* (2002). Furthermore, it was found that the respondents had low serum ferritin and low serum iron levels in both normal and anaemic group.

Garden cress seeds are rich source of protein, fat, iron, calcium and phosphorus. Processing through dehusking changed antinutrient levels without much erosion in nourish ability. In this way garden cress seeds, after being processed through as simple as dehusking could become helpful in preventing and curing various diseases like PEM, anaemia, osteoporosis, osteomalacia and bone fracture through long term consumption as a food stuff of nutraceuticals nature. Incorporation of garden cress seeds into food products like biscuit, *Kheer*, *Ladoo*, *Parantha*, cutlet developed here, could benefit all age group individuals for nourishment and those at risk or suffering from anaemia, fractures and diabetes mellitus, and the other chronic degenerative diseases to pursue prevention and management of these diseases.

The study concludes that inclusion of garden cress seeds alone and with vitamin C, which has high content

of iron, on a daily basis effectively, increased haemoglobin level in those respondents who have low initial haemoglobin level. The seeds of Garden cress could be used as food supplement in human diet as it contains considerable amount of iron and calcium. Presence of high carbohydrates, macro and micro elements and antioxidant properties would increase its utilization. The very low antinutritional factors in the tubers may not hamper its nutritional value.

Garden cress seeds evaluated in present study may be use to help the human body to reduce oxidative damage when the natural mechanism of antioxidant protection becomes unbalanced by factors such as ageing, deterioration of physiological functions may occur resulting in diseases like cancer, cirrhosis, various inflammatory diseases etc. and accelerating ageing. Due to high free radical scavenging potential leads to consumption of mixed or balanced diet may show rich nutritional as well as medicinal value of the garden cress.

**Conclusion :**

Globalization, industrialization, increase in purchasing power and the general enhancement in the standard of living have led to vast and drastic changes in the choice of foods and eating patterns among all age groups of the Indian population in the past few decades. This has led to the effortless adoption and inclusion of foods eaten in the western world in our daily diet. Garden cress leaves and seeds (GCS and GCL) are used in western countries in many recipes. Garden cress seeds if crushed and then used to decrease tangy smell from it. Garden cress seeds soaked in coconut water, milk and water increases nutrients in it also improves the acceptability of recipes prepared from the seeds. The present study proves that the seeds of garden cress could be used by us as food supplement in human diet for removal of anaemia as it contains considerable amount of iron.

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