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Therapeutic uses and Nutraceutical Recipies of Tiny Seeds of *Lepidium Sativum* (Haleem)

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Abstract:- Haleem (*Lepidium sativum*) an annual herb which is easily cultivated all over the world.As seeds are tiny in size, peppery taste and are packed with nutrients like iron, fiber ,folate ,vitamin C,A,E And K protein and many more. As the haleem crop matures within 90 days , it does not require fertilizers. This paper reviews medicinal properties and uses in the food industry.

I. INTRODUCTION

Haleem or Alliv (*Lepidium sativum*) is an annual edible fast growing herb in the world.It is widely used in Africa, India ,China and other eastern countries. Ethiopia is the native place of Haleem .In India it is cultivated as a salad plant and culinary herb (Wealth of India ,1998) in Madhya Pradesh, Rajasthan, Gujarat and Uttar Pradesh .In Ayurvedic pharmacopeia it is used as an official herb in India. Haleem seeds possess various biological properties like antioxidant, antitumor, antimicrobial, antispasmodic, hypoglycemic, allelopathic and bronchodilator properties. In ayurveda it is used to pacify vata and kapha (wealth of India,1998). All the parts of this herb like root, stem, leaves ,seeds and whole herb are consumed in the form of salad ,sprouts, seasoning, garnishing and leaves are cooked with other vegetables also.It is also cultivated as indoor plant due to less requirement of water. It is rich in phytochemicals,alkaloids, poly and monounsaturated fatty acids. In ancient times, Romans and Egyptians used these seeds for health promoting benefits.Haleem seeds are used in the form of natural source and no additives and preservatives are added (Prajapati and Dave,2018).

➢ *Taxonomic Classification*

- Kingdom : Plantae
- Division : Magnoliophyta
- Class :Magnoliopsida
- Order : Brassicales
- Family : Brassicaceae
- Genus : Lepidium
- Species : sativum

➢ *Names of Haleem Across Different Countries:*

- English : Cress,Common Cress, Garden cress, pepper cress
- Spanish : Lepido, Mastuerzo, berrohortense, lepidio, berro de jardín
- German : Gartenkresse Italian Agretto, Cressione
- French :Cresson de fontaine, Cressanalenois, Passeragecutivee
- Arabian : Habburshad
- Russian : Kress-Salat Portuguese Masturco, Mastruco, Agrião-Mouro, Herba Do Esforzo.

➢ *Vernacular Names of Haleem Plant in India (Prajapati and Dave, 2018)*

- Hindi :Chandrasur, Halam, Chansur,Halim
- Sanskrit : Raktabija, Chandrika,Charmahantri, Pashu, Mehana, Karika, Nandini, Karavi, Bhadra,Suvasara, Vasapushpa,Chand Shura
- Himachali: Haloyen Urdu Halim
- Kashmiri :Alian Punjabi Halium, Holan, Shargundai, Tezak
- Marathi : Haliv,Ahaliva, Gujarati Asheliyo, Asaliya
- Assamese: Candriki, Halim Shak Bengali Halim Shak, Alevarie
- Malayalam: Asali Oriya Hidamba saga
- Telugu: Adiyalu, Adeli Tamil Alivirai, Ativerai
- Manipuri : Chantruk Kannada Allibija, , Kurthika

II. MORPHOLOGY

Plants are erect ,glabrous and attain a height of up to 50 cm.Leaves are lobed with linear segments. At the bottom of the stem leaves are long shaped and small green feather-like leaves on the opposite side of the stalk at its top. Although there is a difference in the shape of leaves but their taste is same.

Flowers are whitish or pinkish in colour small sized arranged in raceme inflorescence. The pods are obovate in shape ,very small in size (5mm.) enclosing small seeds(Vaishnavi et.al 2020).The seeds are small , peppery,oval shaped, pointed and triangular at one end ,smooth about 3-4 mm.long,1-2mm.wide reddish-brown in

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colour a furrow present on both surfaces extending up to 2⁄3 downward, a slight wing like extension present on both the edges of the seed. The Seed coat swells when soaked in water and gets covered with colorless mucilage . Botanical description of garden cress plant Characteristics

Table 1 Physical Characteristics of Garden Cress Seeds

Height	Leaves Shape	Flowers	Pods	Harvesting Time
47-50cm	Lobed shape with linear segments	Small, white to pinkish in colour	Obovate,5 mm length	90 days after sowing seeds

Table 2 Parameters

colour	Shape	Taste
Reddish _brown	Oval	pungent,pappery with hot mouth feel

Table 3 Dimensions of Seeds

	Width (mm)	Thickness (mm)	Sphericity (%)	Bulk density (kg/m3)	True Density (kg/ m3)	Porosity (%)	Weight of 1000 seeds (g)
2.60	1.20	0.94	54.59	729.74	1230	40.67	1.86

- *Cultivation of Seeds:*

Best season for the cultivation of haleem seeds is winter ,but it is grown in all the seasons as it requires little moisture. For cultivation, the seeds of haleem are mixed well with manure and are sown 5-6 cm.deep in the soil . The seed are cultivated in wide rows. Growth of garden cress plants is very rapid and crop matures after 90 days of germination (Vaishnavi et.al.,2020).

Microscopic characters of the seed as revealed by Bigoniya et.al(2011) that endosperm is composed of thick walled polygonal cells surrounding the small sized polygonal embryo.

- *Phytochemical Constituents :*

Lepidum sativum seeds are rich in calcium, iron,folic acid,vitamin A and vitamin C.Secondary metabolite glucosinolate is the major component in(Gokavi et.al.2004)garden cress seeds.Nutritional composition of garden cress seeds per 100 gm.is

Table 4 Phytochemical Constituents

Protein	Carbohydrates	Fiber	Ash	Moisture
24.2%,	30.7%	11.9%	7.1%	2.9%

- *Total Essential Amino Acids is 47.08% which Include*

- Histidine : 3.87 gm
- Threonine :2.66 gm
- Arginine : 4.51 gm.
- Valine 3.04 gm.
- lcium :266.35 gm
- Methionine: 0.97 gm.
- Phenylalanine: 5.67 gm
- Isoleucine : 5.11 gm
- Lycine : 6.26 gm

Table 5 Essential Amino Acids

Histidine	Threonine	Arginine	Valine	lcium	Methionine:	Phenylalanine	Isoleucine	Lycine
3.87 gm	2.66 gm	4.51 gm	3.04 gm.	266.35 gm	0.97gm	5.67 gm	5.11 gm	6.26 gm

Table 6 Non-Essential Amino Acids

Proline	Aspartic Acid	Glutamic Acid	Serine	Glycine	Alanine	Tyrosine
5.84gm	9.76gm	19.33 gm.	4.96 gm	5.51 gm	4.83 gm	2.69 gm

Table 6 Minerals in Garden Cress Seeds Are

Calcium	Copper	Iron	Magnesium	Manganese	Phosphorus	Potassium	Sodium	Zinc
266.35 mg	5.73 mg	8.31 mg	339.23mg	2.00 mg	608.63 mg	1236.51 mg	19.65 mg	6.99 mg

Singh and Pashwan, (2017)

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➢ *Uses of Different Parts of Herb Haleem*

Roots of this plant are used in second syphilis and tenesmus.In syphilis root powder is taken with Luke cow's milk.

- *Leaves* :

Decoction (three times a day) is used for curing diuretics which is prepared by boiling leaves in water (Mali et al., 2007;Agarwal and Sharma., 2012).Leaves along with seeds also show antimicrobial activity(Ibrahim and Kabid ,2020).120 reference.

- *Herb*:

Paste of whole herb is used as an expectorant in asthma and cough which is taken four times a day . In bleeding piles an infusion of crushed herb with water is taken twice a day (Falana et.al.2014,).

- *Seeds*:

Seeds are used in curing abdominal coli,as aphrodisiac, asthma,pleurisy ,hypertension, renal diseases, leprosy and rapid bone fracture healing.Seeds are mostly used as poultice in sprain,leprosy and skin diseases. Roasted seeds mixed with ghee and sugar are given for relieving general weakness and to lactating mothers for increasing the milk secretion.(Mali et.al.2007).

➢ *Phytochemical Constituents of Haleem Seeds :*

Garden cress seeds are rich in alkaloids,cardiac glycosides,anthraquinone glycosides,tannins ,steroids flavonoids. Seeds are also rich source of iodine (Shipard,2003).These seeds contain variety of phenolic compounds which are shown below:

- Gallic Acid
- Protocatechuic Acid
- Coumaric Acid
- Caffeic Acid
- Coumaric acid
- Caffeic Acid
- Ferulic Acid
- Vanillic Acid
- Caffeoylquinic acid
- Coumaroylquinic Acid
- Kaemferol
- Querecetin

➢ *Therapeutic uses of Halim Seeds:*

- *Bone Healing and Fracture*

Seeds of Haleem are used for healing the fractured bones or accidental injury ,when consumed with fresh water or warm milk.For fast recovery, the powder of haleem seeds mixed with water is applied on the affected area.Fracture healing property of haleem was also experimentally proved on the rabbit in the laboratory (Sharma et.al.2011).Dixit et.al.2020 suggested the bone healing property in rats are due to presence of calcium and phosphorus in high amount.

- *Antidiabetic Effect of Halim Seeds* :

Haleem seeds have a significant role in controlling diabetes. Alkaloids like lepidine and glucotropaeolin present in haleem seeds are beneficial against diabetes (Abdullah and Abdullah 2007;Singh and Pashwan,2017).Halim seeds show hypoglycemic effect which is independent of insulin secretion thus decreases the blood glucose level (Prajapati and Dave ,2018).

➢ *Anticancer Property*

As haleem seeds are rich in various phytochemical and antioxidants such as tocopherols, carotenoid, eugenol, terpenoids, glucosinolates, 3'5'- dimethoxyacetophenone hexadecanoic acid,methyl esters.

As haleem seeds are rich in alpha linolenic acid and phytochemicals such as terpenoids, organosulfur compound alkaloids and phenolic compounds, these compounds protect against different types of cancer. (Khan et.al.2008). Secondary metabolite like glucosinolate present in haleem seeds inhibit the proliferation of carcinogenic cells.Diwaraka et.al.(2008),Barba et.al.,2016;Rajasekaran and Suresh,2021).Haleem seeds also prevent breast cancer due to the presence of Omega- 3 and Omega - 6 fatty acid.(Mahassni et.al.,2013) and arrest the cancer cell cycle and cause apoptosis (cell death of cancer cell).

- *As a Galactagogue :*

As Haleem seeds are rich in iron and proteins,it stimulates the secretion of milk in lactating mothers (Singh et.al.2015) . It is given postpartum for increasing the milk secretion (Pattnaik ,2003). Ten gm.of seeds are sufficient for enhancing the milk secretion.wellness much.com2021

- *Antianaemic Effect :*

Being rich in heme iron ,which is easily absorbed in the intestine,it best for anemic patients by increasing hemoglobin level , (Singh and Paswan,2017) . After half an hour of the intake of haleem seeds, Vitamin C which is a source of ascorbic acid increase the absorption of iron. L-ascorbic acid facilitates iron absorption by forming a chelate with ferric iron at acid pH converting them to ferrous state that remains soluble at the alkaline pH of the duodenum which gets easily absorbed .

- *Regulation of Menstrual Cycle :*

Haleem seeds serve as an emmenagogue which stimulates blood flow in the uterus and pelvic area which induce menstruation. Haleem seeds contain glycosides,flavonoids, sterols,saponins,tannins etc.which regulate the menstrual cycle (Singh et.al.2015).

- *Antioxidant Property :*

Antioxidant property in Haleem is due to the presence of phenolic compounds such as tocopherols in the seeds. It acts as a free radical scavenger (Malar et.al.2014) and due to antioxidant potential (Prajapati and Dave,2018) it reduces glutathione level in the kidney (Muhammad et.al.2012).

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- *Anti-Inflammatory Effect :*

This property is due to the presence of imidazole ,essential and non-essential aminoacids in Haleem seeds (Rehman et.al.2012).The presence of secondary metabolites like flavonoids, alkaloids, cynogenic glycosides (traces),tannins, glucosinolates,sterols,triterpenes also contribute to inflammatory effect. It is also evident from the experimental study by Wadhwa et.al. (2012) on rats and observed that Haleem seeds inhibit carageenan - induced paw adema and reduced hyperplexia effect.

- *Effect on Bronchial Asthma :*

Ethanol extract of haleem seeds protects against acetylcholine and helps to prevent asthma as reported by Mali et.al.,(2008).Paranjape and Mehta (2006) concluded from the study on males and females of age groups between 15 years to 80 years old that one gm powder of haleem seeds given orally to the patients four times a day was effective in such patients.

- *Antifungal Activity:*

Petroleum ether extract 2.5% and 10% of haleem seeds have powerful antifungal activity (Adam et.al.,2011). Sharma et.al.(2012) studied 2-8% of ethanoic extracts of seeds against fungal growth like Fusarium equiseta, Aspergillus flavus,Alternaria alternata.which was very effective against such fungi.

- *In Height Increase :*

Haleem seeds are helpful in increasing the height as these seeds promote the secretion of growth hormones (Oluwatosin et.al.2018)

- *Oral Contraceptive :*

Sharief and Gani,(2004) reported the use of haleem seeds as an oral contraceptive in mice.

- *Weight Loss :*

Intake of haleem seeds with water in the morning before breakfast helps to reduce weight naturally (Singh et.al.,2015).

- *Traditional Uses :*

As haleem seeds are rich in nutrients, these are garnished in salads (Mali et.al.2007;Falana et.al.2017).The leaves of haleem plant are used as edible vegetables in Purulia district in West Bengal (Mali et.al.,2007) .

- *In Diary and Food Products :*

Seeds of this plant are used as food supplements in preparing various dishes which are described below:

- *Burfee:*

In preparing burfee ,Bengal gram floor is slowly roasted in ghee and a mixture is prepared by adding concentrated sugar solution and 15% haleem seeds ,the mixture is spread and after settling, cut into square pieces (Bansal et.al.2013;Jain et.al.2016).

- *Panjiri:*

Wheat floor and haleem seeds were slowly roasted in ghee for 10 minutes,on cooling the mixture , jaggery powder was added to get nutritious panjiri(Kaur 2013).

- *Chikki :*

For preparing Chikkis ,first of all jaggery syrup is prepared by crushing jaggery and water and heated . To this mixture roasted peanuts and haleem seed powder is thoroughly mixed and spread on a plate cut into pieces(Jain et.al.2016).

- *Ladoo :*

Ladoo are prepared by roasting Bengal gram powder (85 gm.) and haleem seed powder (15 gm.) separately to light brown colour.Then this mixture is fried in ghee (60gm) for 2-3 minutes and allowed to cool.Add sugar (70gm.) ,mix well and form ladoo(Jain et.al.2016).

- *UPMA :*

Instant upma prepared by mixing fox tail millet and haleem seeds.(Rodge et.al.2018).

- *Dahiwala Bread:*

This is an instant breakfast and is highly nutritious which is prepared by mixing curd with bread slices,then fried in soybean oil and fortified with haleem seed (Agarwal and Sharma, 2013).

- *Health Drink :*

A health drink prepared by the adjunction of haleem seeds enhances the nutritional properties of milk.This type of drink helps to improve growth of lean muscles (Singh and Pashwan, 2017).

- *Cookies:*

Cookies are prepared by mixing oats flour , Bengal gram flour ,semolina,cardamom powder and haleem seeds which overall make dishes in nutrient enrichment (Yadav et.al.2018).

III. CONCLUSION

Haleem seeds have a wide range of therapeutic properties and high nutraceutical potential and can be used against malnutrition (Painuli et.al.,2022).Being rich in nutritional components and bioactive compounds , It could be used as a supplementary food and it should be popular among people. Seed powder of haleem can be also supplemented with whey protein (Doke and Guha,2014).Therefore planting,conservation and sustainable use of such nutritionally valuable crop is required.

Disclaimer:Pregnant and breast-feeding mothers should consume haleem seeds only after the consultation of Ayurvedic practitioner . As haleem seeds have hypoglycemic properties, its dose should be taken after the advice of Ayurvedic professionals.

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