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Garlic: An Immunity Booster Spice during Pandemic Situation

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Abstract

India has been bestowed with a wide range of climates and physio-geographical conditions and as such is most suitable for growing various kinds of horticultural crops such as fruits, vegetables, flowers, nuts, spices and plantation crops. Among the spice crops, Garlic (*Allium sativum*) is a functional food well-known for its immune-modulatory, antimicrobial, anti-inflammatory, anti-mutagenic, antitumor properties. Its antiviral efficiency was also demonstrated. Some constituents of this plant were found to be active against protozoan parasites. The relations among immune system parameters, leptin, leptin receptor, adenosin mono phosphate-activated protein kinase, peroxisome proliferator activated receptor-gamma have also been interpreted. In conclusion, garlic *Allium sativum* may be an acceptable preventive measure against pandemic situations to boost immune system cells and to repress the production and secretion of pro-inflammatory cytokines as well as an adipose tissue derived hormone leptin having the pro-inflammatory nature.

Introduction

Garlic (*Allium sativum*) is one of the important bulb crop grown and used as a spice or condiment throughout India. It is also important foreign exchange earner for India. It is consumed by almost all people who take onion. Garlic has higher nutritive value than other bulb crops. It is rich in proteins, phosphorous, potassium, calcium, magnesium and carbohydrates. Garlic contains a higher concentration of sulfur compounds which are answerable for its medicinal effects (Chakraborty and Majumder, 2020). Ascorbic acid content is very high in green garlic. Garlic is also known to possess insecticidal property. Garlic is frost hardy plant requiring cool and moist period during growth and relatively dry period during maturity of bulbs. Bulbing takes place during longer days and at high temperature, exposure to low temperature subsequent to bulb formation, favours the process. The critical day length for of 12 hrs along with temperature also affects bulbing. Exposures of dormant cloves or young plants to a 20 °C temperature or lower depending upon varieties for 1-2 months hastens subsequent bulbing.

Nutritional and Health Benefits of Garlic

Healthy garlic bulbs contain allicin, colourless, odourless and water-soluble amino acids. On crushing the garlic bulbs the enzyme allinase breaks down into allin to produce allicin of which the principal ingredient is odoriferous diallyl-disulfide. Garlic contains about 0.1% volatile oil. The chief constituents of oil are diallyl-disulfide (60%), diallyl-trisulfide (20%), allyl propyl disulfide (6%), a small quantity of diethyl disulfide and probably diallyle poly-

sulfide. Diallyle-disulfide possesses the true garlic odour. Garlic has been cultivated for thousands of years. It is the most ancient cultivated vegetables giving pungency of the genus *Allium*. Original abode of garlic is said to be Central Asia and Southern Europe especially Mediterranean region. Some authorities consider that *Allium longicuspis* Regael, which is endemic to Central Asia, is the wild ancestor and spread in ancient times to Mediterranean region. It is known in Egypt in Predynastic times, before 3000 BC and also to ancient Greeks and Romans. It has long been grown in India and China (Immelman, 2006).

Table 1: Nutritive Value of Garlic

Nutritive Value of Garlic Particular	Fresh peeled garlic cloves	Dehydrated garlic powder
Moisture (%)	62.80	5.20
Protein (%)	6.30	17.50
Fat (%)	0.10	0.60
Mineral matter (%)	1.00	3.20
Fibre (%)	0.80	1.90
Carbohydrates (%)	29.00	71.40
Energy K. Cal	145.00	--
Calcium (%)	0.03	0.10
Phosphorus (%)	0.30	0.42
Potassium (%)	--	0.70
Magnesium (mg/100 g)	71.00	--
Iron (%)	0.001	0.004
Niacin (%)	--	0.70
Sodium (%)	--	0.01
Copper (mg/100 g)	0.63	--
Manganese (mg/100 g)	0.86	--
Zinc (mg/100 g)	1.93	--
Chromium (mg/100 g)	0.02	--
Vitamin A (IU)	0.40	175.00
Nicotinic acid (mg/100 g)	0.40	--
Vitamin C (mg/100 g)	13.00	12.00
Vitamin B (mg/100 g)	16.00	0.68
Riboflavin B2 (mg/100 g)	0.23	0.08
Thiamin (mg/100 g)	0.06	--

Garlic was carried to the Western hemisphere by the Spanish, Portuguese and French. Garlic was not liked by Romans due to strong odour. It was used in England as early as first half of the 16th century. The early domestication of garlic took quite different turn from that of seed propagated leek and onion. Garlic became exclusively vegetatively propagated by cloves or bulbils. Some cultivars are reported to produce flowers but there is no seed setting. Garlic cultivars differ in maturity,

bulb size, clove, clove size and number, scale colour, bolting and flowering habits (Mustafa and Orkide, 2020).

Some Problems in Garlic Production

- Though, India holds premier positions in area and production, the productivity of garlic (5.27 tons/ha) is very low compared to other countries.
- This is mostly because of tropical genotypes grown in India which have very low yield potential and are susceptible to diseases and pests due to tropical climate and lack of irrigation at critical stages of crop growth.
- Several other factors are also responsible for the low yields in our country.
- These are mainly lack of disease resistant/ tolerant varieties, non-availability of quality seeds/ planting materials of improved varieties, lack of desirable F1 hybrids leading to poor seed replacement and inadequate/ poor storage facilities high production cost and highly volatile market.
- There is a wide gap between the present national average yield and potential yield of garlic.
- Bridging this wide gap is sufficient to increase the country's production many fold and to meet the domestic need as well as export requirement.
- Garlic if properly processed can be stored for longer periods; still heavy losses are encountered during transportation and storage.
- Hence, there is a need to reorient our future research and developmental programmes targeting for increased production, productivity and keeping quality of garlic by developing suitable genotypes having high yield potential, resistant to pests and diseases and also tolerant to drought to meet both domestic and export demands and more particularly limiting the imports during crisis.

Table 2: Potential for productivity increase at the national level (tons/ha)

Crop	National Farmer	Progressive farmer	Research station	Abroad
Garlic	5.27	10.00	15.00	20.00

Essential Strategies to Overcome the Barriers

- India possesses many innate advantages over other garlic producing countries - its large genetic base, varied soil and climatic conditions and skilled human power.
- However, the productivity is still low. Poor soil fertility, use of low level of inputs like manures, fertilizers and crop protection chemicals, high labour cost and crop loss due to diseases, lack of resistant varieties and post harvest losses are the major reasons for low productivity.

- The major handicaps that Indian faces in the international market are the high cost of the product and high level of contaminations. India will need to make concerted efforts to produce clean and residue free and with competitive prices.
- India can withstand competition only by increasing productivity and reducing cost of cultivation leading to low cost per unit of production.
- Considerable efforts will have to be made to improve the present post harvest processing and storage systems and in educating the farmers and traders in handling/ processing the produce hygienically.
- Higher productivity, clean produce through improved post harvest techniques and reasonable threshold price affordable to food industry are the keys to future trade and promotion of garlic in the country.
- There is a need to focus our research programmes to develop value added products particularly frozen and de-hydrated and ready to eat food products for export.
- The production and productivity of garlic increased substantially during past 3 decades. The expected requirement considering demand for export, domestic consumption, seed bulbs etc. by 2030 will be about 250 lakh tons.
- The production and export both were quite low before 1975. The future trading is going to be tough in view of stringent regulations imposed by ASTA, FDA, USDA, EPA and American Customs. Prioritization is important, but all the strategies are inter-linked to achieve the goal of resilient development.
- Locating resistant source and evolving high yielding and disease resistant lines through selection, mutation, polyploidy breeding and biotechnological methods are the important programmes for crop improvement.
- Multi location testing of varieties for adaptation and quality, evaluation of lines suited to organic production, scaling up the production of nucleus planting material of elite lines are the need based programmes for development of garlic.

- Studies may be oriented towards identification of varieties which can adapt to climate change and also management strategies to mitigate the ill effects of climate change.
- The recent advances in technologies such as satellite imagery, use of GPS and mapping techniques using GIS have greatly improved the understanding of land use planning.

Conclusion

Since ages, Garlic has been used for its medicinal properties; this spice has been one of the active ingredients used in many ancient medicines. Even in the books of Ayurveda, there's a mention of this magical spice and its immunity boosting properties. Garlic contains sulphur compounds, which are believed to bring some of the health benefits. Garlic is low in calories and rich in vitamin C, vitamin B6 and manganese. Garlic supplements help prevent and reduce the severity of common illnesses like the flu and common cold; reduces total and LDL cholesterol. As the world battles the deadliest pandemic Covid-19, the virus scare has engulfed the masses so much that staying at home to stay alive has been the utmost priority of nations across the globe. In fact, amidst the corona virus scare and the need to build a strong immunity, adding garlic to your daily diet can be a good idea.

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