

SCIENTIFIC GARLIC PRODUCTION, A PROFITABLE CROP TO OF FARMERS

Harshita Singh and Suryapal Singh
CCSHAU, Hisar

Garlic (*Allium sativum* L.), a member of Alliaceae family, also known as stinking rose, star of envy or poor man's treacle is the second important bulb crop after onion and extensively grown throughout the country. It is the oldest cultivated herb being widely recorded in ancient Indian, Chinese, Egyptian and Sumerian cultures. Sanskrit writings document the use of garlic remedies about 5000 years ago. It is an important and remunerative crop, used both as a spice and condiment. Garlic is cultivated as a Rabi season crop in the Indian plains for its bulbs. It is annual for bulb and biennial for seed production. The plant is native to central Asia and later spread to Mediterranean region. Now a day, it is grown worldwide mainly in China, India, South Korea, Egypt, Russia, Bangladesh, Myanmar, Spain, United States of America, Ukraine, Brazil and Uzbekistan. In India, it is cultivated in Madhya Pradesh, Rajasthan, Uttar Pradesh, Gujarat, Punjab, Assam, West Bengal, Haryana, Maharashtra, Karnataka and Bihar. Madhya Pradesh is leader state in garlic production since it is contributing 30% of the total production of garlic in India. India ranks second in area and production of garlic after China, covering an area of 317 thousand hectares with a production of 1611 thousand tonnes and in Haryana, it is grown in 5 thousand hectares, producing 32 thousand tonnes, particularly in the district of Kurukshetra, Ambala and Karnal.

Garlic is known for its high commercial value of bulbs, which is the most commonly used plant part, but other parts viz., leaves and flowers/bulbils on the head (spathe) are also edible, being consumed while immature and still tender. Leaves of garlic are stir-fried with eggs, meat, or vegetables in many parts of Asia. Garlic is widely used for its pungent flavor as a seasoning or condiment and is a key

ingredient of most dishes of Asian, the Middle East, European and American countries. It is generally used in combination with onion, tomato, or ginger. A variety of classic dishes can be prepared with garlic such as garlic bread, garlic toast, bruschetta, crostini, aioli, ajoblanco, etc.

In Eastern Europe, the shoots of garlic are pickled and eaten as an appetizer. Its young bulbs are kept in a mixture of sugar, salt, and spices for around three to six weeks to be used as pickle. In United States of America, garlic festivals are celebrated every year, where famous chefs exhibit their important sines containing garlic as the key ingredient. Garlic contains about 0.1 % volatile oil rich in sulphur contributing to its pungency. The major elements of oil are diallyl disulphide (60%), diallyl trisulphide (20%), allyl propyl disulphide (6%), a small quantity of diethyl disulphide and diallyl polysulfide. These sulphur compounds add to the smell as well as taste of garlic. It is also used in the form of juice, syrup and tincture.

Garlic is a natural health promoter and a wonder herb low in calories, saturated fats and sodium. It contains about 62.8% moisture, 6.3% protein, 0.1% fat, 0.8% fibre and is a good source of carbohydrates (29.0 g) along with a number of valuable minerals such as phosphorus, potassium, zinc, calcium, magnesium, iron, copper, selenium as well as trace minerals like iodine, sulphur and chlorine. According to USDA National Nutrient Database, garlic is loaded with B-vitamins (folate, thiamine, niacin, and B6), vitamins C, A, and K. Moreover, it is one of the rarest dietary sources of organic compounds, viz., allicin, allisatin1, and allisatin 2. Garlic has miraculous pharmaceutical effects as it possesses anti-cancer, anti-viral, anti-oxidant and anti-inflammatory properties.



It is effectual in the management of the cardiovascular diseases, lowering cholesterol levels and blood pressure. It is well recognized in the control and treatment of worms, germs, bacterial and fungal diseases, diabetes, cancer, ulcer, rheumatism, etc. Furthermore, it is beneficial in ailments like arthritis, gout, stroke, cataract, etc. Garlic syrup is a treasured medication for asthma and chronic bronchitis. Also, garlic bulb infusion is said to be effective in treating epilepsy. Anti-aging and anti-hyperlipidaemic effect of garlic has also been reported by various researchers.

Other uses take account of treatment of fever, whooping cough, headache, stomach ache, hair loss and haemorrhoids. All this has gained it the label of super food. Extract of garlic have nematocidal, fungicidal and insecticidal action too. Its crude extract is relatively effective against gram-positive and gram-negative bacteria, and also found to restrain the growth of some bacteria, resistant to commonly used antibiotics. Foot rot disease in French bean can be controlled by treating the seeds with garlic extract and its 1% extract provides protection against mosquito and black fly for about 8

hours. Garlic extract in conjunction with chilli and ginger has been found beneficial against soil nematodes. Root-dip treatment of tomato seedlings with Allicin 25 ppm for 5 minutes is effective against *Meloidogyne incognita*. Although, India is second largest producer of garlic in the world, but the Average marketable bulb yield is very low as compared to China and other garlic producing countries. Furthermore, over the years, productivity has remained almost stagnant. The average productivity is only 5.76 t/ha.

Since, cultivation of garlic has aroused interest among the farmers of Haryana and other parts of the country because of its steadily increasing demand in the market at attractive rates; this is obviating the need to increase its production for the maximization of bulb yield per unit area. Among the various factors, irrigation especially at critical growth stages is an important factor influencing the yield, as water is a solvent of nutrients and a pre-requisite to successful garlic production. It is reported that garlic tolerates neither excess water nor water stress as both could decrease bulb yield up to 60 percent. Being shallow rooted crop, it is sensitive to

water limitation and drought stress particularly during bulb initiation and development. Economic yield of this crop depends on optimum soil moisture, which can be made possible by proper management of irrigation. In garlic, flood irrigation is widely practiced in India, which results in inefficient use of applied irrigation water due to either percolation or evaporation. On the other hand, modern drip irrigation system offers practical alternative to surface irrigation, which helps in achieving 90-95% efficiency by reducing evaporation and deep percolation. Reduced evaporative losses and high uniformity in irrigation eventually results in high irrigation application efficiencies. It is one of the latest systems, becoming increasingly popular in areas with water scarcity and salt problems.

Moreover, it is making a positive impression on sustainable agriculture in India. Amongst several agro-techniques, adequate and balanced nutrition occupies an important role in increasing plant height, leaves per plant, number of cloves per bulb, weight of bulb, yield and quality of garlic. Nitrogen is necessary and important element for increasing the yield and quality of garlic. Availability of nitrogen is of prime significance for growing plants as it is a major and fundamental source of protein and nucleic acid molecules. It is also vital part of chlorophyll, which is responsible for photosynthesis. It also helps in improving activity of roots and bulb development by supporting uptake of other nutrients. The

deficiency of nitrogen in soil has an overriding control on plant growth and dominates the effect of other plant nutrients. Application of nitrogen has found to increase leaf initiation rate and extension of garlic in early growth stages. It also enhanced bulb growth and development in garlic. An increase in dry matter production of bulb and bulb yield were observed due to nitrogen application. Since, nitrogen fertilizer is costly input, every effort needs to be made to improve the utilization of applied nitrogen by a crop. Apart from source of nitrogen, the method and time of application are important deciding factors for increasing its efficiency. Intensification of agricultural production to meet increasing market demand necessitates the synchronized application of irrigation water as well as fertilizers. The application of fertilizers through drip irrigation system (fertigation) is effective way to promote efficient use of these meagre and expensive resources.

Moreover, it has several advantages over the traditional methods. By using drip fertigation, the time and rate fertilizer to be applied can be regulated precisely. This will also ensure the application of proper amount of N at particular growth stage for enhanced plant growth and development, consequently improving the nitrogen use efficiency, decreasing leaching and volatilization losses and minimizing ground water contamination. In addition, applying nitrogenous fertilizer through irrigation water is more convenient and less expensive method as compared to traditional methods. Hence, applying fertilizers directly to crop root zone through drip.

