Allium sativum (Garlic): The Folk and Modern uses-
Part II

N.C.Shah.

Ex-Head of the Division of Botany & Pharmacognosy, CIMAP (CSIR) & Founder Director, Herbal Research & Development Institute, Govt. of U.P. (now in Uttarakhand), MS-78; Sector- "D"; Aliganj, Lucknow -24

Abstract

The present paper reviews the most recent pharmacological & clinical researches of Allium sativum Garlic, on ailments and diseases on the basis of 17 (seventeen) sections of modern treatment as prescribed in (CIMS, 1914). Its introduction in India and its uses in the past as stated by the British colonial physicians with a brief account of the physicians, who had for the first time investigated the medicinal plants of India on scientific basis, especially of William Dymock. Further, its total production in the world, China stands first in its production, and the Garlic- festivals, which are celebrated annually, in different regions of USA.

Keywords: Classifications; Garlic-festival; World-production; Introduction; Pharmacological trials and Clinical studies; British physicians; William Dymock.

Introduction

Biomass In the 1st part the history and uses of plant in different culture like Mesopotamia and Egypt and its introduction in Europe, India, Japan, China, etc. were discussed. Further, its chemical constituents with its pharmacological activities was reported and it was highlighted that it is an anticancer agent.

In this part, its uses in specific ailments and diseases such as cardiovascular, pains & fever; as an anti-inflammatory; in diabetes as a hypoglycemic, its haematological & hepato-protective and pharmacological and clinical activities, are discussed along with its introduction in India with its total production in the world, in different countries. The 'Garlic festival' observed in different parts of USA is also described.

Since long A.sativum, L. (Garlic) and A.cepa, L. (Onion) are being cultivated throughout the world and also in India. Though, Garlic was introduced in America in the post-Columbian period, which is very recent, considering the introduction of Garlic in India and China from the middle–east countries, in the very early past. The native place of Garlic is said to be Sicily, where it was found growing wild, Ainsley (1826).

Introduction of Garlic in India

It is certain that Garlic was introduced in India after the writings of vedic literatures, other wise, it would have been referred and mentioned mainly in Atharva veda. This is also to mention here that Yasti-madhu, Liquorice, Glycyrrhiza glabra, which is also an exotic and important Ayurvedic drug, has not been mentioned in the Vedic literature.

As we have seen in the first part, Shah,(2014) that garlic was introduced in India from the Middle-East countries, but when? No doubt, India was on trade with Mesopotamia and Egypt about 1500-2000 BC. The utility of garlic as a medicine and condiment was well known to the people of the above stated countries. We have seen that garlic is not mentioned in Atharva veda and there is no definite time or period ascertained for its introduction in to India. However, one has to speculate with some related facts about the introduction of Garlic in India as shown below:

Rule of Persian King in India

Centuries ago during ca 520 BC., a Persian king, whose kingdom was from Persia to Afghanistan, Pakistan, Kashmir and the present Panjab and Haryana. And, it is possible that it was introduced, during the reign of the Persian King.

By Arabian Traders

In Later years, before the 1st centuary, A.D., when the Arabian traders (merchants) began to trade with India and began to settle down in the western coast of India. Possibly, they brought with them for their own daily use with their other trade goods to India and in return, traded from India with crude drugs, silk, spices, etc. The progeny of these traders are still found in India.

In Carak Samhita

Received: June 2014
Accepted: July 2014

* Corresponding Author
  E mail: shahnc_dr@gmail.com
However, it is well mentioned in Carak Samhita, compiled and edited by a court physician Caraka (125-150 AD), who was a court-physician of Kanishka, an Indo-Scythian king, who ruled India in the 1st century AD. The plant is well mentioned by Caraka, in Carak Samhita (ch.su.27) (100 or 125-150 A.D.), under the name 'Lahsunah'. Caraka had also reported, its Ayurvedic pharmacology to bring it under parameters of Ayurveda. Not only this, garlic is also mentioned in 'Bower's Manuscripts, which is also known as Navanitikam (350-375 A.D.). No doubt some people believe that it is a part of Caraka Samhita, which was found in Mongolia by Bower, Shah,(1980).

In Sushruta Samhita

Later, Sushruta, (800-900 A.D.) or (700-800 A.D.) who was a 'Court physician' with the King of Banaras (Varanasi). He incorporated garlic under the name of Rason in his work, Sushruta Samhita ( Su. Soo-46). The herb was Ayruvedically analysed on the parameters of 'sat-rasa' viz., madhur, lavan, katu, tikta, kasaya and amla and out of these 'six-rasas' only five were present in garlic (Rason), only the amla ras, is missing.

Raj Nighantu & Bhava Prakash Nighantu

Narhari, in 1600 A.D., wrote 'Raj Nighantu' and the physician, Bhava Misra, also in, 1600 A.D. compiled and wrote 'Bhava Prakash Nighantu' interestingly, had also described, six 'rasas' in, the whole plant of garlic, i.e., root contains 'katu', leave- 'tikta', stem- (nal)-kasaya and the upper portion of stem- (nala agra)- lavan and the seeds- madhur. It means before giving the name 'Rason' the plant was under cultivation in India. A number of Ayurvedic preparations were prepared, which are discussed in the Part I, (Shah,2014).

Greeks' introduction

Further, we know that garlic is known by various Sanskrit names, however, its name, Yavanpriya, meaning 'likings of the Greeks' yavan word was used for the Greeks, in general. The Greeks were the soldiers in the army of Alexander the Great, who invaded India in 325-327 BC. It is possible that the the Greeks would have brought its bulb-lets for their medicinal as well as for culinary purpose as a spice & condiment and thence, introduced in India.

The Mohmeddan introduction

Later, the Mohmeddans invaders, 600-700 AD., who were called by the Hindus as Malecha or 'filthy people' and named garlic after their habits as malech-kanda, meaning, 'the tuber of the Mohmeddans'. Possibly, the the Mohmeddans' had brought garlic with them for their own use. The Hindus disliked the Mohmeddans', who were cruel and filthy. The Hindus also did not like their food habits, who often ate cow-meat therefore, they kept them at their arms' length mostly by the Brahmins and by the orthodox Hindus and both these sects, hated the Mohmeddans and prohibited their food articles in their own use, like garlic and onion and the Mohmeddans often slaughtered cows as they were the cow-meat eaters. Further, garlic and onion has awful smell and as a mark of hatred against the Mohmeddans, both the commodity was treated as unholy, 'apavitra' by the orthodox Hindus and by the Brahmins.

Not only, the Brahmins but also the Indian Budhists and the Jainis also prohibited garlic and onion in their food.

Indian mythological story

On one side, the garlic was not eaten and even touched by the Brahmins and the Jainis and by the orthodox Hindus, on other side, the physicians like Caraka and Sushruta included it in Ayurveda. Not only this, due to its medicinal properties and utility the Hindu mythologists concocted a story of its origin, which states, " When, Devas (the Hindu Gods) and Asuras (the Demons) fought for nectar (Amrita) during churning of the ocean of milk, (Samudra-mathan). During that sequence or process two Asuras were able to get access to Amrita or nectar and had taken some quantity in their mouths. Knowing the Asuras' foul play the God chopped the heads of those Asuras before they could swallow it, and as a result few drops of Amrita fell down on the earth from their mouths, which later grew as Rason (Garlic) plant.

Sections of treatment in modern medicine

Generally, the treatment of the following ailments and diseases; in the modern system of medicine, is classified and studied in main 17 (seventeen) sections; 01-Alimentary system; 02-Cardiovascular system; 03-Central nervous system; 04-Pain & Fever ;05-Musculoskeletal system; 06-Endocrine system; 07-Diabetes; 08-Fertility & Antifertility agents; 09-Genito-urinary system; 10-Infections and Infestations; 11-Respiratory system; 12-Nutrition and metabolism; 13-Allergic disorders; 14-Ear, nose and oropharynx; 15-Eye; 16-Skin; 17-Neoplastic disorders; 18-Immuno-suppressants, 19. Surgical and 22. Dressing & Appliances. (CIMS,2014).

However, the clinical trials have resulted in the following clinical pharmacological activities, (WHO, 1999, p. 20).

01-Carminative activity

Garlic has demonstrated carminative activity in human studies. It was concluded that garlic sedated the stomach and intestines and relaxed spasm, retarded hyper peristalsis, and dispersed gas.

01-Action on Gastric Secretion

Garlic was shown to be highly significant in increasing the secretion of gastric acids.

02- Cardiovascular system; Anti hypertensive or Hypotensive and Hypocholesterolemic activity

Fresh garlic, garlic juice, aged garlic extracts, or the volatile oil all lowered cholesterol and plasma lipids, lipid metabolism, and atherogenesis both in vitro and in vivo in humans and rats. Anti hypercholeserolaemnic and antihyperlipidaemic effects were observed.
in various animal models after oral (in feed) or intra-gastric administration of minced garlic bulbs; water, ethanol, petroleum infragastric administration of minced garlic bulbs, etc. Similarly, anti-hypertensive activity and inhibition of platelets aggregation both in vivo and in vitro studies of garlic has also been demonstrated.

Now a days, cardiovascular disease(CVD) has emerged as a high mortality global rates Allicin is one of the important ingredient obtained from garlic. It has a quality that it can easily absorbed by the cell membrane into the cell without inducing any damage to the phospholipids bilayers and rapidly metabolized. It was found to provide cardioprotective effects by inducing vasorelation alleviating various pathological conditions of CVD, including cardiac hypertrophy, angiogenesis, platelet aggregation, hyper lipemia, and hyper glycemia. Allicin was also found to protect the cardiovascular system by enhancing the antioxidant status. No doubt it also benefits the the anticancer and antimicrobial activities of the body. It is well concluded that allicin has the potential to be developed into a health product for the cardiovascular system, Chan et al (2013).

02-Antihypertensive activity

Garlic has also demonstrated antihypertensive activity in vivo. Oral or infragastric administration of minced garlic bulbs, or alcohol or water extracts of the drug, lowered blood pressure in dogs, guinea-pigs, rabbits, and rats.

02-Hypertension

A meta analysis experiment was conducted on the effect of garlic on blood pressure and it resulted that garlic may have some clinical usefulness in mild hypertension, but there is still insufficient evidence to recommend the drug as a routine clinical therapy for the treatment of hypertension.

02-Lipid lowering activity

In a meta analysis experiments, in eight studies it was found that in seven out of eight studies it was observed that a dose of 600-900 mg of garlic powder reduced serum cholesterol and triglyceride levels by 5-20% and it was confirmed that garlic powder preparations do have the lipid-lowering potential.

02-In Atherosclerosis

Clinical studies have demonstrated that dry powder decreased plasma viscosity, tissue plasminogen activator activity and the haematocritical level, that is, it showed increase in fibrinolytic activity in the serum of patients suffering from atherosclerosis.

02-Fibrinolytic activity and inhibiting platlet aggregation

Garlic inhibited platelet aggregation in both in vitro and in vivo with water, chloroform, or methanol extracts inhibited collagen.

02-Effect on Haemorheology

Daily ingestion of 800 mg of powdered garlic for four weeks significantly decreased the percentage of circulating platelet aggregates and spontaneous platelet aggregation. In one study patients with hypercolesterolaemia treated with a garlic oil macerate for 3 months platelet adhesion and aggregation decreased significantly.

02-Anticoagulant Property

Garlic contains a blood anticoagulant factor which is a non-volatile, odourless, white substance soluble in water. This factor had a hypocalcemic effect, which is due to the combining of it with the blood calcium.

02-Anticholesterolic and anti lipemic activity

Fresh garlic, garlic juice, aged garlic extracts, or the volatile oil all lowered the cholesterol and plasma lipids both in vitro and in vivo studies.

03. Central Nervous System

Dymock, et al (1891) has described an Ayurvedic formula prepared from Garlic in in facial paralysis, hemiplegia, sciatica, paraplegia, and convulsive affections (see part Ist). However, this formulation under the name of Rason Kalk (Adopted from Sarandhar Samhita 2-5) is described as follows: Fully riped-garlic clove is used. Then 1/5 part of the following condiments and salts are taken; roasted Asafoetida (Heeng), Black-salt (Kalanaamak), Bishop’weed (Ajwain), cumin(jeera), rock salt (Lahori namak), Sendha namak(salt), ginger (in form of Sonth), long pepper, and black pepper, all are taken in equal proportions, and powdered and ground with garlic. is given in doses of one tola, every morning with the decoction of the root of the castor oil plant (Ricinus communis), Garga (1961.p).

05-Anti Inflammatory Activity

Garlic showed slight anti-inflammatory activity against formalin arthritis in albino rats. 60 Highly significant anti-inflammatory activity in both Carrageenin induced oedema and granuloma pouch in albino rats were noticed with a commercial preparation in Japan, 'Marutas' containing garlic and also the alcoholic extracts showed anti-inflammatory activity against carrageenin induced rat hind paw oedema, in albino rats.

07-Diabetes or antidiabetic activity

Allicin showed hypoglycemic activity comparable to that of Tolbutamide in rabbits with mild alloxan diabetes. It significantly improved glucose tolerance and increased serum insulin and also glycogen synthesis in the liver. Similarly, garlic extracts were hypoglycemic, when given orally to alloxan diabetic rats.

07-Hypoglycaemic activity

In an experiment, where garlic powder (800 mg/day) to 120 patients for 4 weeks in a double blind, placebo controlled study decreased the average blood glucose by 11.6 %. In another study no such activity was found after dosing non-insulin dependent patients with 700 mg/day of a spray-dried garlic preparation for one month.

07-Diabetes or hypoglycaemic activity

Hypoglycaemic effects of garlic have been demonstrated in vivo with oral administration of an aqueous ethanol, petroleum ether, or chloroform extracts, or the essential oil of garlic, lowered blood glucose levels in rabbits and rats. In Brazil, garlic is popularly used in the treatment of diabetes and cardiac complications. In an experiment the possible mechanism, sulfonylurea receptor (SUR) selectivity of allicin in diabetic hypertensive rats was conducted. It was inference that allicin is effective in the treatment of diabetic hypertension: through a mechanism that might involve selective opening of SUR2, (Dubey et al., 2012)
19. Surgical and 20. Dressing & Appliances

It is reported that during the War of 1914 in Europe an army surgeon observed that when juice of garlic mixed with the water which first heated and then cooled and applied on fresh wounds of any kind with soaked cloth and tied. The wounds do not deteriorate and is not infected and progress towards healing. Further, the surgeon admitted that this treatment he learned from a French woman, who was giving this treatment in the war field. The surgeon also tried this treatment on other types of wounds successfully. (When you do not have any immediate first-aid of any kind then this is the treatment one can use.)

Haematological effects

The effect of garlic on some biochemical and haematological parameters on rat showed significant reduction levels of glucose cholesterol, serum acid phosphates, serum alkaline phosphatase and neutrophill and also significant increased level of protein, lymphocytes eosinonophil, Hb percentage, total leucocyte count and red blood cell count, serum albumin level and monocyte count did not show significant changes, the value remained more or less same. So garlic can be used to treat diseases, in garlic made biochemical and haematological alterations and has shown effectiveness on some parameters, (Kanchan, 2012).

Hepatoprotective

Biological activity of garlic has been attributed to organo-sulfur compounds, most of all to oil soluble allyl sulﬁdes, such as diallyl sulﬁde(DAS), diallyldisulﬁde(DADS) and diallyltrisulﬁde (DATS). In this study the effectiveness of garlic–derived allyl sulﬁdes in inﬂuencing peroxidative processes, levels of thiols and sulfanes sulfur and its metabolic enzymes in normal mouse liver cell was conducted. The DADS and DATS showed beneficial action on liver cell during chemotherapy or for alleviation of liver damage, (Iceik et al., 2012).

Precautions and Side effects

It is also reported that large amounts of garlic may increase the risk of postoperative bleedings. Garlic is contraindicated in patients with a known allergy to the drug. It is harmful for the patients taking warfarin as it increases bleeding time. It is also reported to evoke occasional allergic reaction such as contact dermatitis and asthmatic attacks on inhalation of powdered drug. Ingestion of fresh garlic bulbs, extracts or oil on an empty stomach may cause heartburn, nausea, vomiting, and diarrhoea. If it is taken with food it prevents gastrointestinal upset.

Such a bizarre of medicinal uses of garlic can be attributed to its nutritive properties at least each and every nutritive constituent required to the body is present in Garlic and that it has been.

Nutritive Chemical composition effects

It is estimated that 100 gm of garlic contains energy 139 kcal and nutritive contents as follows:- Carbohydrates-33.6 gm; sugar 1 gm; dietary fiber-2.1 gm; fat-0.5 gm; protein-6.36 gm; Niacin-(vit.B3) - 0.7 gm; Pantothenic acid (B5)-0.596 mg; vitamin B6- 1.235 mg; Folate (vitamin B9)-3 ug; vitamin-C- 31.2 mg; calcium-181 mg; iron-1.7 mg; magnesium-25 mg; manganese- 1.672 mg; phosphorus-153 mg; thiamine (vit.B1)- 0.2 mg; riboflavin (vit. B2) - 0.11 mg. poassium-401mg; sodium-17mg; zinc-1.16mg; selenium-14.2mg (Source: USDA Nutrient Database).

Effect of cooking on various compounds in garlic effects

No doubt the therapeutic activities are related to various sulphur compounds as discussed in Part I (Shah,2014). Verma et al., (2008) has stated that besides the thiosulphate there are also polar compounds of phenolic and steroidal origin and are not pungent and more stable in cooking and are discussed in detail along with the chemical composition of different garlic preparations and the effect of cooking on its sulfur compounds of different garlic preparations and the effect of cooking on sulphur compounds.

Uses in India as described by British physicians effects

When the British people ruled India they also brought with them the physicians mostly in their army, who not only treated their army soldiers but also conducted research on the medicinal plants and herbs in India. The foremost researcher was Whitelaw Ainsley, who wrote, Materia Medica of Hindostan in 1813 published from Madras as he was the Superintending Surgeon in the army. He very minutely observed the treatment which was being done in the Southern part of India. On garlic, Ainsley (1813) wrote, “This article forms an almost constant ingredient in the curries and other dishes that are used by the native Indians. As medicine, the Vytans (the local physicians or Vaidyas) prescribe it to quicken the circulation, and warm the habit. They also consider it as a useful expectorant, particularly in Asthma which they call Mandarra Cashum, which signifies the asthma of cloudy weather.” Ainsley (1826) also published his experiences and observations in the book, Materia Indica published from London. However, Birdwood (1862) has treated garlic under spices and condiments. Dymock et al., (1891) stated, “in climate like India, where dyspepsia is frequent, and perhaps rendered still more so amongst the natives, by their living so much on vegetable diet garlic, by supplying a gentle and grateful stimulus to the stomach, is highly useful; the Romans had an idea, that it in a peculiar manner gave strength to the human frame. He further states,” The Hindoos are in the habit of preparing a kind of expressed oil from Garlic called valley poonda unay. (in Tamil language) it is of a stimulating nature, and ordered internally in agues, and externally in palsy and rheumatism.

William Dymock

William Dymock belonged to the west of England, and was educated first at Bristol, then at Rugby, and after- wards at Oxford where he took a B.A. degree. After a course of medical studies, he became M.R.C.S. Eng., he then joined the Indian Medical Service, and was appointed to the Bombay Presidency in 1857. He saw active service during the Mutiny with the Kathiawar Field Force against the Wagheers, and was present at the capture of Dantal Hill. For two years he was attached to the Indian Navy, and visited the ports of the Persian Gulf and the East African Coast. In 1868 he served as a member of a Committee for publishing the Pharmacopoeia of India, and at the time he was Acting Resident Surgeon at the European General Hospital.

After taking two years' furlough to England he was appointed in 1871 to be Principal of the Medical Store Department, Bombay, and in this capacity he laboured for nearly twenty years, until his retirement from the service on 30th April 1890. During this time he devoted all his energies to the study of materia medica and pharmacy. He largely increased the local manufacture of galenicals preparations, and introduced modern and improved machinery in the Department laboratory. For his skilful and efficient management he was thanked by Government on three separate occasions. Dr. Dymock was proficient in Arabic, Persian, Sanskrit, Hindustani, Marathi and Guzrati ; he was also familiar with Greek and Latin, and corresponded freely in French,
German and Portuguese. He was a Fellow and Examiner of the University of Bombay, and being an eminent linguist he was for many years a member of the Presidency Board for the examination of officers in Oriental languages. Bombay being the drug market of the East, he availed himself of the many opportunities of examining new and rare vegetable products, and having a good knowledge of botany, he was often able to identify the sources of the drugs. He was for some years Professor of Materia Medica in the Grant Medical College and as a teacher of this science he was said not to have a rival in India.

World Production of Garlic in 2010

China was the top producer of Garlic in the world. The rest of the produces of garlic are as under:

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Table 1. Total Production in 2010, in the world was : 17,674,893 tons.

The Garlic Estivals in Florida, USA

Garlic has become such an important culinary commodity that in United States of America Garlic Festivals are celebrated every year in number of places. These festivals are fun-food and recreation and local food championship festivals in which famous chefs demonstrate their important cuisines, in which garlic is the main ingredient they are given one hour to prepare a unique three-course gourmet feast.

Some of the important places where Garlic festivals are celebrated in USA are:

"The Annual Gilroy Festival" in California. In this festival about 100,000 people participate every year in weekend of July at Gilroy.,

"The Hudson Valley Garlic Festival‘ is scheduled at the time of Garlic harvest period generally, in the weekend of September at Cantine Field in Saugerties Mile Marker 101, NY State Thruway.

"The Cleaveland Festival” at Shaker square, celebrated also in September

"The Delray Beach Festival” celebrated at Delray Beach, in California.

In these festivals people assemble to enjoy various kinds of food preparations in which Garlic is much used, a number of stalls are established to serve the food; sometimes competitions are also held for honoring the best chef. The festival is a fun-fare, where many things are put for enjoyment. like music dance, etc. In these festivals some time one lac of people assemble, the entry is always by tickets. The funds so collected are used in social works. (www. htpg garlic festival).

References

CIMS.2014. CMPM Medico India Pvt. Ltd.


