

# Extracts from the history and medical properties of garlic

Biljana Bauer Petrovska, Svetlana Cekovska<sup>1</sup>

Department of Pharmacognosy, Faculty of Pharmacy, Vodnjanska 17, <sup>1</sup>Department of Medical and Experimental Biochemistry, Faculty of Medicine, 50 Divizija 6, SS Cyril and Methodius University, 1000 Skopje, Republic of Macedonia

Submitted: 02-03-10

Revised: 06-04-10

Published: 10-07-10

## ABSTRACT

At the time when antibiotics and other pharmacy products did not exist, a bulb of garlic itself represented a whole pharmacy industry due to the broad spectrum of effects. Most different suppositions involving this herb are mentioned; some of them were so pointless that they disappeared in time, but some of them have remained until the present days. The garlic was given different names that are still in use such as 'Russian penicillin', 'natural antibiotic', 'vegetable viagra', 'plant talisman', 'rustic's theriac', 'snake grass' etc. Presentation of the development of ideas associated with garlic and the evolution of the notions increased the ability of the pharmacists and physicians to respond to the challenges of their professional services in facilitating human life.

**Key words:** *Allium sativum*, garlic, history, usage

## INTRODUCTION

Garlic (*Allium sativum* L. Fam. Liliaceae) is a widely distributed plant. Nowadays, it is cultivated all over the world. In our region, it is the most important preventive remedy, a universal folk spice and food, a well-trusted remedy. In the past, garlic has been utilized as a remedy during the various epidemics such as typhus, dysentery, cholera, influenza, and whenever an epidemic has emerged, garlic has been the first preventive and curative remedy.<sup>[1]</sup> In the ancient and middle centuries and a long time during the modern period, garlic has been appreciated as a remedy by physicians from different nations. Recently there has been scientific research into garlic, and good results have been obtained in healing many diseases, from which for thousands years nations from various continents had been protecting themselves and healing by using garlic. Therefore, there is an increased necessity of research on the history of garlic for the sake of reinforcing the ability of pharmacists and physicians to respond to the challenges arising in the provision of professional services in order to facilitate human life.

## CHRONOLOGY FROM THE PAST TO THE PRESENT

### History of Garlic

The native land of garlic is Middle Asia.<sup>[2]</sup> There are a range of beliefs as to the exact origin of garlic such as that it originates

from West China, around Tien Shan Mountains to Kazakhstan and Kyrgyzstan.

Sumerians (2600–2100 BC) were actively utilizing the garlic healing qualities, and there is a belief that they brought the garlic to China, from where it was later spread to Japan and Korea. Garlic expansion probably occurred in the old world first, and later in the new world. Nonetheless, some historians still claim that garlic originates from China.<sup>[3]</sup>

In ancient China, garlic was one of the most used remedies since 2700 BC. Then, owing to its heating and stimulating effects, it was placed in yang (the yin yang concept, according to which in the good there is bad and in the bad there is good). Garlic was recommended to those who suffer from depression. Therefore, because of these stimulating effects of the garlic, the Japanese have not included garlic in the Buddhist tradition. The Japanese cuisine does not appreciate garlic either.<sup>[4]</sup>

In ancient Indian medicine, garlic was a valuable remedy used as a tonic, roborans, to cure a lack of appetite, common weakness, cough, skin disease, rheumatism, haemorrhoids etc. In the Vedas – the Indian holy book – garlic was mentioned among other medicinal plants. Indian priests were the first physicians and pharmacists, and unsurprisingly the healing was accompanied and complemented by diverse spells and rituals, prayers, secret and magnificent ceremonies.<sup>[5]</sup>

The Egyptians were familiar with many medicinal, aromatic, spicy and poisonous plants. In the beginning, when they were still minor and impoverished, they were satisfied with their own medicinal plants from their flora, around the Nile River. It was garlic that was used most. Subsequently, when they were

#### Address for correspondence:

Prof. Biljana Bauer Petrovska,  
E-mail: biba@ff.ukim.edu.mk

DOI: 10.4103/0973-7847.65321

gaining power and mercantile importance, they were increasingly searching for medicinal plants with strong physiological activity, strong spices and aromas from the East. The usage of garlic continued but now as food and remedy of poor, i.e. the slaves.<sup>[3]</sup> The Egyptians fed their slaves with garlic to make them strong and capable of doing more work. The Old Greek historian Herodotus<sup>[1]</sup> wrote: 'Inscriptions on the plates of the Egyptian pyramids tell us how much their builders used the garlic for this vegetable, 1600 talents of silver were spent (approximately 30 million dollars)'.<sup>[4]</sup> In this period, garlic was an irreplaceable nutritional supplement. Builders commonly ate insipid food (different porridges) and only a third of this food was utilized in the organism. If it had not been for the garlic, which builders used to a great deal, they would not have been able to keep balance, let alone pull the gigantic plates. Besides providing them with the necessary quantity of vitamins, garlic additionally supported them with another of its properties – decreasing the need for food.<sup>[4]</sup> The Egyptian crypts are the oldest visible inscriptions for the existence of garlic. Archaeologists have discovered clayey sculptures of garlic bulbs dating from 3700 BC, while illustrations with garlic have been found in another crypt from 3200 BC. In Ebers papyrus (around 1500 BC) various medicinal plants have been mentioned, and among others the much appreciated garlic, efficient in healing 32 illnesses.<sup>[3,4]</sup> The youngest pharaoh Tutankhamen (1320 BC) was sent on his trip to life beyond the grave escorted by garlic, as a patron of his soul and protector of his wealth. Archaeologists have discovered garlic bulbs in the pyramids.

Ancient Egypt was of great significance for the healing skills, preparation of remedies and overall for the culture of ancient peoples such as the Phoenicians, Israelis, Babylonians, Persians etc. All of these desert or semi-desert peoples, who essentially were cattle breeders and nomadic, regularly used garlic. Its implication was also felt later, in the Middle and New Ages, with all peoples living around the Mediterranean Sea, and has lasted to date. Consequently, now the countries around the Mediterranean Sea, especially those in the East coast, still use garlic in large quantities.<sup>[4]</sup>

The Ancient Israelis made use of garlic as a starvation stimulator, blood pressure enhancer, body heater, parasite-killer etc. The Talmud, the book of Judaism prescribes a meal with garlic every Friday. In the Bible a meal with garlic and cheese is mentioned, which used to be consumed by reapers.

The Ancient Greeks also valued garlic although those who had eaten garlic were forbidden entry into the temples (they were called 'rank roses'). During the archeological excavations in the Knossos Palace on the Greek island of Crete, garlic bulbs were discovered dating from 1850–1400 BC. Early Greek army leaders fed their army with garlic before major battles. It is an interesting fact that while nowadays some athletes take a wide spectrum of dangerous tranquilizers, Greek Olympic athletes eat garlic to ensure a good score.<sup>[4,5]</sup> According to Theophrastus (370–285 BC), the Greeks offered gifts to their

Gods consisting of garlic bulbs, which they used to lay on the main crossroads. Orpheus referred to garlic as a remedy. In his works, Hippocrates (459–370 BC)<sup>[6]</sup> mentioned garlic as a remedy against intestine parasites, a laxans and a diuretic. Dioscorides (40–90 AD) recommended garlic as a remedy for colic relief,<sup>[4]</sup> an anthelmintic, for regulating the menstruation cycle and against seasickness.<sup>[7]</sup> He also recommended garlic as a remedy against snakebite (for that purpose they drank a mixture of garlic and wine) and against mad dog's bite (for that purpose they applied garlic on the wound directly). Hence, the Greeks called garlic a snake grass.<sup>[3]</sup>

The Tibetans possess ancient recipes to cure stomachache with garlic. It was grown in the gardens of Babylon, and the local population used to call it a 'rank rose'.

At the beginning when the Romans had not occupied territories outside the small roman state, similar to other primitive and poor nations they were using plants only from their territories, mostly cabbage, garlic and onion, as a remedy, spice and food. Later in the vast and influential Roman Empire, garlic and onion remained to be a remedy, spice and food for survival of the poor, while the rich people were increasingly using and finding pleasure in valuable medicinal plants with intense physiological effects, mostly delicate aromatic spices and aromas from all of the invaded territories in Asia and Africa. Vergilius mentioned the usage of a squashed juice from garlic and wild thyme, and according to him, mowers should lubricate their body with this juice if they wanted to rest peacefully for they would not be bitten by a snake. Pliny the Elder (23–79 AD), a Roman physician and scientist from the first century, considered garlic a universal remedy.<sup>[6]</sup> He wrote that the Egyptians used to take an oath by mentioning garlic and onion, considering them two holy and miraculous plants. In the 1<sup>st</sup> AD century, Columel said that garlic was used as an aphrodisiac. Celsius in the second century was using garlic to cure tuberculosis and fever.<sup>[6]</sup> Galen (121–200 AD), the renowned medical writer and physician among Romans, and later among other nations, referred to as the father of galenic pharmacy, spoke of garlic as the most popular folk remedy that cured many diseases and named it a 'rustic's theriac'. Galen used garlic for regulation of the digestion and against colic.<sup>[3,6]</sup>

In all mountains of his kingdom, Ashurbanipal, the last great tsar of Assyria, was hiding clay plates on which diverse evidence of the life, customs and rituals of the Babylonian–Assyrian world were recorded. Among the 10000 volumes of this clay library, volumes devoted to medicinal plants existed. In the first Assyrian book of medicinal plants, garlic was given a special place. Cut into large pieces and left in the clay pot, vapor closed for 30 min, garlic was used as a remedy for reducing the body temperature. They prepared tea from garlic and solid resin, which was used as a remedy against constipation. Assyrians prepared tea from garlic as a poultice. In addition, garlic emulsion was used against muscle inflammation. Furthermore, garlic mixture against intestine parasites was made. Garlic was quoted on these clay plates many times, and they also contain data that the tsars

paid particular attention to garlic.<sup>[4]</sup>

In the seventh century AD the Slavic people used garlic against lice, spider bite and snakebite and against ulcers and crusts.<sup>[8]</sup>

In the Arabic school medicine in the Middle Ages, garlic was a specially valued remedy.<sup>[6]</sup> In the Middle Ages, Arabic physicians contributed to a large extent for the expansion of the usage of garlic as a remedy. In the same period, the retrograde Western Europe knew nothing about garlic.<sup>[3]</sup>

With Eclogue – law of the Byzantine Empire in the eighth century, the cultivation of garlic was encouraged. In St. Clement's time (ninth century), garlic was used for prevention of blood vessels aging. Garlic was also recommended as a remedy in the literary works of Macedonian health educators (Pejchinovski and Krchovski) in the 19<sup>th</sup> century. Garlic was also stated in Ohrid's book of remedies by Eftim Sprostranov, as a remedy against blood pressure, typhoid fever abdominals, icterus, alopecia.<sup>[8]</sup>

Garlic was brought into Great Britain in 1548, from the coasts of the Mediterranean Sea, where it was present in abundance.<sup>[4]</sup> Lonicerus (in 1564) recommended garlic against helminthes, and externally for curing a range of skin diseases and dandruff.<sup>[3]</sup> In ancient Europe, it was used without restrictions – particularly in Italy, while the French used to add it to a lot of dishes. The wild garlic was growing and was cultivated in church courtyards in England for centuries. In all likelihood, the cultivation of garlic commenced in England before the 16<sup>th</sup> century. It has been proven that garlic is one of the first plants to have been cultivated by man. Over the time people have learned to prepare teas and tinctures from garlic and simultaneously learned how to mix equal quantities of garlic and honey etc. As a result, they beat many gastric infections, learned how to fight cold, fever, diarrhea, thereby prolonging the life of many sick people. Owing to garlic, in 1720 a thousand inhabitants of Marseille were saved from the spread of the epidemic of plague.<sup>[4]</sup> In 1858, Louis Pasteur wrote that garlic killed bacteria. As he maintained, it was effective even against some bacteria resistant to other factors. He also noted that garlic killed *Helicobacter pylori*.<sup>[9]</sup> The antiseptic properties of garlic were confirmed in the keeping down of cholera (in 1913), typhoid fever and diphtheria (in 1918) in Beirut.<sup>[6]</sup> French phytotherapist Lekrek used garlic as a preventive remedy with success during the great pandemic of influenza, the so-called 'Spanish fever', in 1918.<sup>[6]</sup> During the epidemic of influenza in America during 1917 and 1918, people wore a necklace of garlic when going out in public.<sup>[9]</sup>

Garlic is also known as Russian penicillin because Russian physicians used it for a long time for treatment of respiratory tract diseases, and along with other compounds it was used as an inhalator remedy for children. In Russia, garlic was also used during preparation for piloting and for a range of military assignments. Very often it was used in the treatment of German soldiers during World War I.<sup>[5]</sup> Although penicillin was already used in World War II, the Russian Red Army continued using

garlic. Therefore, garlic was renamed into Russian penicillin or natural antibiotic.<sup>[9]</sup>

### Medical properties of garlic

Garlic has a slight, imperceptible smell until it has been peeled. Once it is peeled, sliced or crushed, it immediately begins to spread an intense smell, distinctive of all plants (horse radish, mustard etc.) that contain sulfur's glycosides. All of these drugs have more or less a sharp smell; in touch with the skin, one feels heat first, then pain. It is been a long since people learned that by distillation with water vapor, garlic yields etheric oil with its characteristic sharp smell. The examination of the chemical content of that oil commenced in 1844. In 1892 and later, it was confirmed that garlic consists of several aliphatic unsaturated sulfur compounds. As late as in 1944, the oily, colorless, unstable substance called allicin was isolated from garlic by Cavallito and Bailey. Later it was established that allicin has strong bactericide power. Even in dilution 1 : 85000 to 1 : 250000, allicin showed antibacterial activity against certain gram-positive and gram-negative bacteria.<sup>[10]</sup> In 1947, the chemical formula of allicin was determined. In 1947 another compound called alliin, with needle-shaped crystals without smell, was isolated. Alliin has no antibacterial action but by adding the enzyme alliinase from fresh garlic, allicin having strong antibacterial action is produced.<sup>[3]</sup>

As indicated by a number of studies, not only does garlic have nutritional components that are vital for the human body but also it can be used against different diseases. It is particularly important in nutrition and in medicine given that it contains compounds such as, sulfur's compounds (alliin, allicin, *diallyl sulfide*, ajoene etc.) water, cellulose, amino acids, lipids, etheric oil, complex of fructosans (carbohydrates), steroid saponosides, organic acids, minerals (Mg, Zn, Se, germanium), vitamins (C, A, from B complex), enzymes etc.<sup>[11]</sup>

The action of garlic is manifold. Because of allicin and other sulfur compounds, garlic has antibiotic, antibacterial and antimycotic action, which has been testified by in vitro studies.<sup>[5,12,13]</sup> The allicin is excreted partly by the respiratory organs; therefore garlic is used to treat respiratory tract diseases. The French phytotherapist Lecraec used garlic tincture in treatment of a patient with pulmonary gangrene. The patient recovered in 17 days.<sup>[14]</sup>

Recent studies have revealed that garlic protects from common cold. For that purpose, patients have been examined during a period of 12 weeks, in the cold season from November to February. The results have demonstrated that those who took garlic were less prone to catching a cold or endured the cold easier than those who were given placebo.<sup>[15,16]</sup>

Allicin and other garlic compounds have hypocholesterolemic, hypolipidemic and antihypertensive activity.<sup>[17,18]</sup> The anti-cholesterolemic and antilipidemic action of garlic has experimentally been proved in rabbits and rats,<sup>[19]</sup> and the antihypertensive action of garlic in rats.<sup>[11]</sup> Garlic protects from

LDL cholesterol. It decreases the concentration of triglycerides and cholesterol in blood.<sup>[5,10]</sup> Thus far, much clinical research has been conducted on defined preparations of garlic, which indicate hypocholesterolemic and hypotensive action.<sup>[12,20]</sup> But, there are also observations in which garlic preparations did not show a considerable decrease of cholesterol in patients with hypercholesterolemia.<sup>[21,22]</sup> Probably these opposite views are related to the use of different doses, standardization of garlic preparations, and different period of treatment.<sup>[23]</sup> Meta-analysis of randomly chosen literary data has demonstrated that garlic is related to decrease of blood pressure in patients with increased systolic pressure but not in patients without increased systolic pressure<sup>[24]</sup>

By decreasing the serum lipids, garlic reduces the risk of atherosclerosis, whereby it prevents depositing of lipids in blood vessels.<sup>[18,25]</sup> People from countries that often use garlic in their cuisine are less susceptible to blood vessel diseases, especially atherosclerosis.

Ajoenes from garlic possess antithrombotic effect:<sup>[5]</sup> they inhibit *lipoxygenases*, increase fibrinolysis and decrease *thrombocytes* aggregation.<sup>[10,12,17]</sup> Significant antithrombotic action has been shown with *in vivo* and *in vitro* systems.<sup>[18]</sup> German Commission E also prescribes the impact of garlic and its preparations on prolonged bleeding and coagulation time.<sup>[26]</sup>

Garlic prevents free radicals generation and supports body protective mechanisms that destroy free radicals.<sup>[17]</sup> Six powerful phenylpropanoids have been isolated from garlic peel.<sup>[22]</sup> The antioxidative and antihypertensive effect of garlic has been observed in 20 patients with hypertension compared to 20 patients with normal pressure, who have been receiving garlic pearls preparation for a period of two months. The results have revealed decreased blood pressure, significant reduction of 8-hydroxy-2-deoxyguanosin, level of nitric oxide and lipid peroxidation, and an increased level of antioxidative vitamins (C and E). This study has pointed to the beneficial cardio-protective action of garlic in essential hypertension.<sup>[28]</sup>

The proven antioxidative, hypocholesterolemic, antithrombotic and antihypertensive properties of garlic help in the prevention of cardiovascular and cerebrovascular diseases, and lessen the risk of development of dementia and Alzheimer's disease.<sup>[29,30]</sup>

Garlic has a strong anticarcinogenic potential. Allicin has proved to be active against sarcoma in rats.<sup>[18]</sup> The garlic extract stops mitosis of carcinogenic cells in all phases, without unwanted side effects.<sup>[5]</sup> *In vivo* examinations have shown that ajoene has powerful anti-leukemic action in patients with acute myeloid leukaemia.<sup>[31]</sup> Scientists from Britain are of the opinion that high doses of garlic extract can help in prevention of cancer. All recent research in the world conducted on this plant is based precisely on such assumptions that garlic contains compounds that are a potential remedy against cancer.<sup>[32]</sup> A large number of scientists are already convinced and have achieved results in this field.<sup>[4,17]</sup>

Individuals suffering from gastric diseases and excessive excretion of hydrochloric acid find it hard to tolerate garlic. Therefore, nowadays, throughout the world, there is increased production of garlic preparations, for increase of appetite, body strengthening, as stimulants of the nervous system, against high blood pressure, high cholesterol, arteriosclerosis, children's helminthes, as effective antiseptic, preventive means against an array of infective diseases (typhoid fever, influenza, diphtheria, cholera), against chronic bronchitis, against dandruff and hair fall, as expectorants, and a cure for ulcers, stoppage of suppuration etc.

Today, garlic as well as garlic preparations are prescribed in many pharmacopoeias in the world, including Ph Eur 6,<sup>[33]</sup> USP XXXI,<sup>[34]</sup> BP 2007.<sup>[35]</sup> It is also incorporated in the list of German Commission E, which is a therapeutic guide in herbal medicine, compiled by a special expert commission of German Federal Institute of Medicines and Medical Inventions. German Commission E recommends usage of an average dose of 4 g of fresh garlic or equivalent preparations of garlic as a supplement to hyperlipemic patients' diet and in prevention of vascular alterations caused by aging.<sup>[26]</sup>

## CONCLUSIONS

Garlic is the plant necessary in everyday life from the past until the present days. It contains active compounds that are responsible for its effect on almost every part of the human body. Garlic is an excellent tonic for the human organism. It has been used for medical treatment of everything, from ancient civilizations to date. Not with standing its confirmed action, in the past it was avoided, even banned, only because of its sharp and unpleasant smell.

From all of the above-mentioned data, it can be concluded that administration of garlic should not be avoided; on the contrary, its intake should be as much as possible since it underlies human health.

## REFERENCES

1. Toplak G.K. Domace lekovito bilje. Zagreb: Mozaik Kniga; 2005. p. 50-51.
2. Jancic R. Botanika farmaceutika. Beograd: Sluzbeni list SRJ; 2002. p. 247.
3. Tucakov J. Lecenje biljem - fitoterapija. Beograd: Kultura 1971. p. 180-90.
4. Vanjkevic SK. Lecenje belim lukom. Beograd: S.K.Vanjkevic 2002. p. 10-7.
5. Gorunovic M. Farmakognozija. Beograd: Gorunovic; 2001. p. 672-80.
6. Tucakov J. Farmakognozija. Beograd: Naučna knjiga; 1948. p. 278-80.
7. Pelagic V. Pelagicev narodni ucitelj. Beograd: Sloboda; 1970. p. 500-2.
8. Nikolovski B. Prilozi od istorijata na zdravstvenata kultura na Makedonija. Skopje: MFD; 1995. p. 56-174.



9. Available from: <http://www.wikipedia.org/wiki/Garlic>. [cited in 2009].
10. Dervendzi V. *Sovremeno lekuvanje so lekoviti bilki*. 2nd ed. Skopje: Narodna Kniga; 1992. p. 306-7.
11. Kovacevic N. *Osnovi farmakognozije*. Beograd: Licno Izdanje; 2000. p. 170-1.
12. Kulevanova S. *Farmakognozija*. Skopje: Kultura; 2004. p. 417-8.
13. Tedeschi P, Maietti A, Boggian M, Vecchiati G, Brandolini V. Fungitoxicity of lyophilized and spray-dried garlic extracts. *J Environ Sci Health B* 2007;42:795-9.
14. Lukic P. *Farmakognozija*. Beograd: SSO Farmaceutski fakultet Beograd; 1985. p. 548-9.
15. Available at: <http://www.umm.edu/altmed/articles/garlic>. [cited in 2009].
16. Available at: [http://www.news.bbc.co.uk/2/hi/uk\\_news/wales/mid\\_6288012.stm](http://www.news.bbc.co.uk/2/hi/uk_news/wales/mid_6288012.stm). [cited in 2009].
17. Amagase H, Petesch BL, Matsuura H, Kasuga S, Itakura Y. Intake of garlic and its bioactive components. *J Nutr* 2001;131:955-62.
18. Agarwal KC. Therapeutic actions of garlic constituents. *Med Res Rev* 1996;16:111-24.
19. Sovová M, Sova P. In vivo Pharmaceutical importance of *Allium sativum* L. 5. Hypolipemic effects in vitro and. *Ceska Slov Farm* 2004;53:117-23.
20. Durak I, Kavutcu M, Aytac B, Avci A, Devrim E, Ozbek H, et al. Effects of garlic extract consumption on blood lipid and oxidant/antioxidant parameters in humans with high blood cholesterol. *J Nutr Biochem* 2004;15:373-7.
21. Isaacsohn JL, Moser M, Stein EA, Dudley K, Davey JA, Liskov E, et al. Garlic powder and plasma lipids and lipoproteins: a multicenter, randomized, placebo-controlled trial. *Arch Intern Med* 1998;158:1189-94.
22. Superko HR, Krauss RM. Garlic powder, effect on plasma lipids, postprandial lipemia, low-density lipoprotein particle size, high-density lipoprotein subclass distribution and lipoprotein(a). *J Am Coll Cardiol* 2000;35:321-6.
23. Silagy C, Neil A. Garlic as a lipid lowering agent: a meta-analysis. *J R Coll Physicians Lond* 1994;28:39-45.
24. Reinhart KM, Coleman CI, Teevan C, Vachhani P, White CM. Effects of garlic on blood pressure in patients with and without systolic hypertension: a meta-analysis. *Ann Pharmacother* 2008;42:1766-71.
25. Durak I, Oztürk HS, Olcay E, Güven C. Effects of garlic extract supplementation on blood lipid and antioxidant parameters and atherosclerotic plaque formation process in cholesterol-fed rabbits. *J Herb Pharmacother* 2002;2:19-32.
26. Blumenthal M. *The complete German Commission E Monographs, Special expert committee of the German federal institute for drugs and medical devices*, Austin; 1998.
27. Ichikawa M, Ryu K, Yoshida J, Ide N, Koda Y, Sasaoka T, Rosen RT. Identification of six phenylpropanoids from garlic skin as major antioxidants. *J Agric Food Chem* 2003;51:7313-7.
28. Dhawan V, Jain S. Garlic supplementation prevents oxidative DNA damage in essential hypertension. *Mol Cell Biochem* 2005;275:85-94.
29. Borek C. Garlic reduces dementia and heart-disease risk. *J Nutr* 2006;136:810-2.
30. Borek C. Antioxidant health effects of aged garlic extracts. *J Nutr* 2001;131:1010-5.
31. Hassan HT. Ajoene (natural garlic compound): a new anti-leukaemia agent for AML therapy. *Leuk Res* 2004;28:667-71.
32. Zhang Y, Yao HP, Huang FF, Wu W, Gao Y, Chen ZB, et al. Allicin, a major component of garlic, inhibits apoptosis in vital organs in rats with trauma/hemorrhagic shock. *Crit Care Med* 2008;36:3226-32.
33. *European Pharmacopoeia*. 6th Edition, Council of Europe, Strasbourg; 2008.
34. *USP 31 The United states pharmacopoeia*. The United states pharmacopoeial convention. Washington: 2008.
35. *British Pharmacopoeia*. British Pharmacopoeia commission, London; 2007.

**Source of Support:** Nil, **Conflict of Interest:** None declared

#### AUTHOR INSTITUTION MAP FOR THIS ISSUE

**Map will be added after issue gets online\*\*\*\***

Please note that not all the institutions may get mapped due to non-availability of requisite information in Google Map. For AIM of other issues, please check Archives/Back Issues page on the journal's website.

Copyright of Pharmacognosy Reviews is the property of Medknow Publications & Media Pvt. Ltd. and its content may not be copied or emailed to multiple sites or posted to a listserv without the copyright holder's express written permission. However, users may print, download, or email articles for individual use.