



## *Bryonia alba* and Its Biochemical, Pharmacological Actions and Toxicity

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**ABSTRACT :** *Bryonia alba* L. belongs to the Cucurbitaceae family and grows in Europe, Asia, America, Africa, Russia, Ukraine and Armenia. The root of *Bryonia alba* has been used for neuropsychical diseases, psychosis, hysteria, paralysis, epilepsy, vertigo, headache, migraine, melancholia, forgetfulness, sadness, absent mindedness, delirium, cardiovascular disease, ischemia, gastrointestinal diseases, gastric ulcer and respiratory diseases. The root of *Bryonia alba* contains an oxidized tetra cyclic triterpens, cucurbitaceous, polyunsaturated hydrocarbons, phospholipids, phosphatidylcholines, ethereal oils, fatty acids, a great amount of amino acids, alcohol soluble enzymes, sugar, carotene, vitamin C and E. *Bryonia alba* increases coronary blood-flow and the amplitude of cardiac contractions. *Bryonia alba* has an antistressor action and increases the working capacity. *Bryonia alba* activates connective tissue cells. *Bryonia alba* markedly increases the oxygen consumption by young and senescent rat brain, liver as well as heart mitochondrial fraction as Korean Ginseng. *Bryonia alba* decreases lipid peroxidation after immobilization stress. In conclusion, *Bryonia alba* like Ginseng used in traditional medicine came from ancient time has a good perspective administration as prophylactic and medical remedy, as remedy of lot of diseases in modern medicine.

**Key words :** *Bryonia alba* L, traditional medicine

*Bryonia* belongs to the Cucurbitaceae family, Genus *Bryonia* includes 15 species, and well known among them are *Bryonia alba* L. and *Bryonia dioica* Jacq (Zolotniitskaya, 1965 ; Tachtadzyan and Fedorov, 1972). *Bryonia* grows in Europe, Asia, America, Africa, Russia, Ukraine and Armenia. *Bryonia* is a perennial, climber plant with caulescent up to 5~10 m, blue-yellow or yellow-white blossom, and has black fruit of 7~8 mm in diameter and seeds 5 mm lengthwise.

Period of blossom is June-July, and fruiting in July-September. Root of *Bryonia* is fleshy from 0.5 kg up to 15~20 kg by weight. Best time for collection of roots is in spring(May) and after fruiting in autumn.

### As a traditional medicine

According to an Armenian scientist Gabikian at paganism, *Bryonia* was turned into a workshop

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as a caring one. There were created legend about Bryonia, and it was counted as a king of plants (Gabikian, 1968; Sepetchian, 1948; Ganalanian, 1969; Vardanian, 1982).

The most popularity as a curing remedy has been Bryonia in Armenia, where according to an Armenia scientist Sepetchian it was known as a universal remedy like ginseng in oriental countries. According to data of Sepetchian the preparations from Bryonia alba were used for treating of more than 40 diseases of almost all the organs and systems (Sepetchian, 1948).

In medieval ages the Armenian physician Amirdovlat (fifteen century) recommended to use Bryonia for being healthy (Amirdovlat, 1926). Many other authors reported that the roots of Bryonia has been used for neuropsychical diseases, psychosis, hysteria, paralysis, epilepsy, vertigo, headache, migrain, melancholia, forgetfulness, sadness, absent mindedness, delirium (Amirdovlat, 1926; Jensen, 1914; Vardanian, 1979), and for the diseases of cardiovascular system, ischemia, cardiac weakness, as haemostatic remedy for internal hemorrhage(metrohagia) (Zolotniitskaya, 1965), gastrointestinal diseases, gastric ulcer (Amirdovlat, 1926; Jensen, 1914), the diseases of respiratory system (Jensen, 1914; Ibn-Sina, 1982; Hahn *et al.*, 1963), supporting locomotory systems diseases, pain in joints, polyarthritis, at dermal diseases, birthmarks, freckles, warts, as cosmetics for skin freshness, dandruff, at hair shedding (Amirdovlat, 1926; Vardanian, 1979). The preparation of Bryonia was used for treatment of cancer (Amirdovlat, 1926; Vardanian, 1979; Ibn-Sina, 1982, Konopa *et al.*, 1974), angina, diabetes (Zolotniitskaya, 1965; Amirdovlat, 1926; Ibn-Sina, 1982), prostatitis, for destruction of renal and urethral calculi, as an analgesic remedy, for teeth ache and teeth gargle, as a diuretic and lactogenous remedy, for removal of fatigue in a result of physical load, etc (Sepetchian, 1948; Amirdovlat, 1926; Ibn-Sina, 1982).

### **Chemical components in *Bryonia alba* root**

It is worthy to note that the usage of the Bryonia in traditional medicine for treatment of lot of diseases is based on empiricism, on the people 's experience for ages without any serious experimental studies. In 1970 's it was found by Polish scientists that compounds from *Bryonia alba* have antitumorogenic influence. The extract of the plant inhibited the growth of carcinomatous and sarcomatous cells (Konopa *et al.*, 1974).

Chemical investigations of roots of Bryonia were started in 18 century. At present it is well known the chemical composition of this roots. The many-sided effects of this plant are explained by its rich set of chemical substances. It contains an oxidized tetra cyclic triterpens, cucurbitaceous, aglycone and their glycosides (bryonine) (Biglino and Nano, 1967; Phalman, 1975; Power and Moore, 1911; Tunmann *et al.*, 1996; Hylands and Kosugi, 1982), polyunsaturated hydrocarbons, so-called trioxyoctadecadienic acids that structurally close to prostaglandins, sterols and their glycosides (Biglino, 1959; Cattel *et al.*, 1979). It contains phospholipids, phosphatidylcholines and phosphatidylethanolamines, ethereal oils and is rich with saturated and unsaturated fatty acids (Biglino and Nano, 1967; Biglino, 1959; Aprikian *et al.*, 1994), some peptides (Tunmann and Linde, 1958), a great amount of amino acids-glutamic, aspartic and gamma amino butyric acid (Tunmann and Linde, 1958), alcohol soluble enzymes, sugar, carotene, C and E vitamins, as well as many other compounds (Zolotniitskaya, 1965; Sepetchian, 1948; Tunmann and Linde, 1958).

### **Biochemical and pharmacological actions**

At present some authors have demonstrated

by experimental investigations that the extract prepared from *Bryonia alba* produces an action on cardiovascular system, increases the amplitude of cardiac contractions, its slowing, makes stronger of the contractility of myofibrillar apparatus of heart, increases significantly the diastolic relaxation which is conditioned by economic usage of energetic substrates of myocardium. It has positive influence on experimental ischemia and infarction of myocardium, increases the volume rate of coronary blood-flow and microcirculation of myocardium, and amplitude of cardiac counteractions (Samvelian *et al.*, 1989).

It is well known that *Bryonia alba* has an adaptogenic influence. The preparation of this plant makes a stimulating and tonic influence on central nervous system. It makes an antistressor action, and increases the working capacity and removes the fatigue (Ibn-Sina, 1982).

*Bryonia alba* causes bright and accelerated activation of connective tissue cells, which is expressed in intensification of fibroblasts function in reparative processes (Hahn *et al.*, 1963). It was shown that cucurbitacines of *Bryonia alba* expressed high affinity to the glucocorticoid receptors in hela cells and decreases of  $^3\text{H}$ -cortisol binding (Nitkowski and Konopa, 1981).

It was demonstrated that highly diluted *Bryonia alba* medications act on immune cells activating macrophages, and changing the expression profile of hematopoietic lineage markers (Oliveira *et al.*, 2011). It is therefore conceivable that *Bryonia alba* medications which are able to act on bone marrow and immune cells may have a potential therapeutic use in clinical applications in diseases where the immune system is affected and also as regenerative medicine as it may allow proliferation and differentiation of progenitor cells (Oliveira *et al.*, 2011).

We have suggested that extract prepared from this plant roots significantly increased rat survival during 50 % mortality. Our investigations

showed that *Bryonia alba* markedly increases the oxygen consumption by young and senescent rat brain, liver as well as heart mitochondrial fraction (Aprikian and Substance, 1992 ; Aprikian *et al.*, 1993). Comparative investigation has shown that *Bryonia alba* and Korean Ginseng (*panax ginseng C.A. Meyer*) have about the similar effect (Aprikian *et al.*, 1993 ; Aprikian *et al.*, 1994 ; Hylands and Kosugi, 1982). N-acetyl aspartic acid (NAA) and *Bryonia alba* reduces gamma glutamyl transferase (GGT) activity. It was concluded that *Bryonia alba* influences on GGT activity only on the background of changed activity of the enzyme (Tourshian *et al.*, 1994).

We have found that the extract from *Bryonia alba* roots increases the camp content and stimulates the adenylate cyclase activity. The extract enhanced the camp-dependent protein kinase activity and increased significantly the incorporation of  $^{35}\text{S}$ -methionine into protein and enhanced DNA synthesis (Aprikian and Substance, 1992). It significantly decreased high levels of lipid peroxidation after 2.5 hour immobilization stress. *Bryonia alba* inhibited the uptake and stimulated the release of neuromediator amino acids such as glutamate, aspartate and gamma-amino butyric acid (Aprikian and Substance, 1992). It reduced the uptake of  $^3\text{H}$ -noradrenaline and  $^3\text{H}$ -serotonine by synaptosomes of both adult and old rats brain and had no effect on the  $\text{K}^+$ -evoked release of  $^3\text{H}$ -noradrenaline from synaptosomes of adult rat brain, but in aging we observed reducing effect.

### Toxicity of *Bryonia alba*

Although the roots of *Bryonia alba* have been used for medicinal purposes in homeopathic medications for fevers, respiratory infections, gastrointestinal disorders, and joint pain (topically), according to animal or *in vitro* research, it should be used with great caution due to its high

toxicity. *Bryonia alba* is considered to possess toxic effects in relatively small doses, and is therefore infrequently used. Symptoms of toxicity are poorly understood though include: colic, vomiting, diarrhea, gastro-enteritis, cardiac depression with weak, thready pulse, fall of temperature, mydriasis, congestive headaches, dizziness, delirium, cold perspiration, and death.

Potential genotoxic activity of aqueous and methanol extracts of *Bryonia alba* roots was studied on human normal (lymphocytes) and transformed (HeLa and Caco-2) cells using single cell gel electrophoresis (the comet assay). The results obtained did not show any evidence of genotoxic effects of *Bryonia alba* roots (Nersesyan and Collins, 2002).

Bryonin of *Bryonia alba* is toxic and may cause illness or death. Livestock may also be poisoned by consuming the fruit and leaves. Forty berries constitutes a lethal dose for adult humans. (Botanical.com)

## CONCLUSION

Paracelsus once wrote: "All things are poison and nothing is without poison, only the dose permits something not to be poisonous." Later Hahnemann formulated the law of similars, preparations which cause certain symptoms in healthy individuals if given in diluted form to patients exhibiting similar symptoms will cure it. *Bryonia alba* used in traditional medicine came from ancient times and has a good perspective of administration as prophylactic and medical remedy as a remedy for a lot of diseases in modern medicine, although it is toxic.

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