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EFFECT OF ENVIRONMENTAL CONDITIONS OF VARIOUS PLACES IN MAHARASHTRA AND KERALA ON THE MEDICINAL PROPERTIES OF *ADHATODA VASICA* NEES AND *OCIMUM SANCTUM* L.

In the subject of Botany

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i. Introduction: Medicinal plants are a source of great economic value all over the world. In India thousands of species are known to have medicinal value and the use of different parts of several medicinal plants to cure specific aliments has been in vogue since ancient times. *Adhatoda vasica* (vasaka) and *Ocimum sanctum* (Tulsi) are two common plants used for upper respiratory tract infections, bronchitis and as an expectorant. The leaves of *Adhatoda vasica* (vasaka) and *Ocimum sanctum* (Tulsi) are important drugs of Ayurveda, prescribed as an expectorant. The leaves of *Adhatoda vasica* contain the alkaloid vasicine which is responsible for small but persistent bronchio dialation (Nadkarni et al 1954) and essential oils which are chiefly responsible for the expectorant action(Chopra et al 1982 & Sivarajan et al 1994). The leaves of *Ocimum sanctum* also contain essential oils and alkaloids responsible for curing upper respiratory tract infections. The present day information about the chemical properties is based on various studies that have been done in different parts of the world and it is likely that the chemical constituents may be varying due to edaphic and geographic factors. Hence it was thought necessary to study if there were any variation in the amount of active constituents present in the plants growing in different regions of India affecting their medicinal properties.

ii. Significance of the study

Medicinal plants play an important role in the development of potent therapeutic agents. The basic use of plants in medicine will continue in future as a source of therapeutic agents and as raw material based for the extraction of semi synthetic chemical compounds such as cosmetics perfumes and food industries, recently even developed countries are using medicinal systems that involve the use of herbal drugs and remedies. *Adhatoda vasica* and *Ocimum sanctum* are known to have several medicinal properties. The juice of the leaves of *Ocimum sanctum* (Tulsi) plant are used as demulcent stimulant and expectorant, it is also used in the cure of upper respiratory tract infection, bronchitis, skin infection and ear ache. An infusion of the leaf has been used as antispasmodic in gastric disorders for children. *Adhatoda Vasica* is also used for chest infections, cold cough, bronchitis and asthama, the juice of the leaves are used in diarrohea and dysentery.

The medicinal properties of both these plants are due to the presence of various essential oils tannins alkaloids and saponins. It was thought necessary to collect samples of these two plants from different regions of Maharashtra and Kerala, and analyse the plants for the essential oils, alkaloids, tannins and saponins and to find out whether the environmental conditions of a particular region affects the amount of these active constituents.

The study will be helpful in identifying the region in which the active constituents are found in maximum hence these plants can be selected to give maximum benefit.

iii) **Objectives-** Medicinal plants are continually being utilized as therapeutic agents in formulation of Ayurvedic medicines, herbal medicines and in local home remedies. However environmental atmospheric pollution may be responsible for decreasing the active principle in these plants.

Ocimum Sanctum (Tulsi) is being used as a medicinal herb in several herbal medicines and in home remedies for thousands of years. Several medicinal properties have been attributed to the plant not only in Ayurveda and Siddha but also in Greek, Roman and Unani system of medicine, it is used in the cure of upper respiratory infection, bronchitis, skin infection, gastric disorder and malaria fever. Tulsi is also known to contain flavaonids such as apijenin, thymol and several alkaloids which are anti inflammatory, anti-arthritic, anti stress and anti pyretic properties. (Shankar, Mondal et al,2009).

Adhatoda Vasica is an ayurvedic medicinal plant which is a home remedy for several diseases, it is mentioned in the Vedas as a herbal remedy for treating cold, cough whooping cough and chronic bronchitis, asthama, as a sedative ,expectorant anti spasmodic and anti helmentic, (Sunita Maurya and Dhananjay Singh, 2010). The leaf juice is also tested to cure diarrhoea, dysentery and glandular tumour. Essential oils are also known to contain ketone, terpene, and phenolic ether which have anti tumour ,anti oxidant, anti ageing and sedative effect(Chopra et al 1982 & Sivrajan et al 1994).

The main objective of the investigation was to

I] To analyze the important chemical constituents present in these two plants (*Adhatoda Vasica* and *Ocimum sanctum*) collected from different regions of Maharashtra and Kerala.

ii] To find out whether the different environmental conditions in the different regions of Maharashtra and Kerala have any effect on the medicinal properties of these two plants in relation to the phytochemical constituents present. The investigation also aimed at identifying the region in which these plants have maximum medicinal properties so as to select the plants from such areas for medicinal preparations.

iii] To find out in which season, maximum active constituents are present indicating to us the time of the year ideal for collection of plant material for herbal preparation.

Methodology:

Plants of *Adhatoda Vasica* and *Ocimum sanctum* were collected from different regions of Maharashtra namely Mumbai, Thane, Raigad, Nasik, Aurangabad, Nagpur, Jalgaon, and in Kerala, Thiruanatapuram, Ernakulam, Thrissur, Calicut and Kottayam, Collections were done twice a year in two different seasons (summer and winter) . The first collection was done in the month of May and the second collection in the month of December. In each region the plants were collected from three different sites.

The following parameters were studied on these two plants collected during both summer and winter season:

i] Vitamin C content by DCPIP titration method

ii] Essential Oil Content by soxhlet extraction

iii] Flavonoid content by spectroscopy

iv] Tannin content by spectroscopy

v] Vasicine content by HPLC
vi] Ursolic acid content by HPLC
vii] Heavy metal content by ICP AES

Results and Discussion

It was observed that in *Adhatoda vasica*, Nees plants collected from Kerala, maximum amount of Vitamin C was observed as compared to the plants collected from Maharashtra. Another observation made was that all the plants of *Adhatoda vasica*, Nees collected from Kerala during the winter season showed a higher level of Vitamin C as compared to plants of *Adhatoda vasica*, Nees collected during summer season. All the plants of *Ocimum sanctum* L. collected from Kerala during the winter season, showed a higher level of Vitamin C content as compared to the plants of *Ocimum sanctum* L. collected during summer season .In case of the plants of *Ocimum sanctum* L. collected from Maharashtra, the maximum amount of Vitamin C was observed in the plants collected from Nashik during the winter season i.e. 48mg/gm of plant material. While minimum amount of Vitamin C was seen in the plants collected from Mumbai during summer season i.e. 12mg/gm of plant material.

It was observed that in *Adhatoda vasica*, Nees plants collected from Kerala, maximum amount of Essential oils was observed in the plants collected from Cochin during the winter season i.e. 0.44gms/ gm of plant material. Whereas, minimum amount of Vitamin C content was observed in the plants collected from Kottayam during summer season i.e. 0.17gms/ gm of plant material .All the plants of *Adhatoda vasica*, Nees collected from Kerala during the winter season showed a higher level of Essential oil content as compared to the plants of *Adhatoda vasica*, Nees collected during summer season It was observed that all the plants of *Adhatoda vasica* Nees collected from Maharashtra during the winter season showed a higher level of Essential oil content as compared to the plants of *Adhatoda vasica*, Nees collected during summer season. Ram Swaroop Varma et al, 2011 have reported that the essential oil content of *Ocimum gratissimum* and *O. kilimandscharicum*during spring-summer cropping season was less compared to the essential oil content of these plants collected during the rain-autumn cropping season.

In the present investigation it was observed that maximum amount of flavanoids was noted in *Adhathoda vasica* plants compared to *Ocimum sanctum*. Plants of *Adhathoda vasica* collected from kerala showed more flavonoid content compared to the ones collected from Maharashtra .The plants of *Adhathoda vasica* collected from Calicut showed maximum amount of flavonoids i.e 6.83%.Plants collected in the winter season showed comparatively higher amount of flavonoids. This observation was also made by Iftikhar et al 2011 in *Mentha longifolia*. However in case of *Ocimum sanctum* maximum amount of flavanoids was observed in the plants collected from Mumbai during the summer season(5.88%).This could be due to pollution stress which increases the flavonoid content in the plants .This is in accordance with the findings of other workers. Lower flavonoid content was observed in the plants of *Adhathoda vasica* (3.70%) collected from the city of Mumbai which is considered to be a polluted city. This is in accordance with the findings of Sharma et al 2012 who have also observed that the flavonoid content in *Adhatoda vasica* decreases with increase in pollution level. The flavonoid content in both the plants i.e *Adhathoda* vasica and *Ocimum sanctum* collected during winter season was high compared to the ones collected during the summer season.

Tannins are known to have antiviral, antitumour, antinflammatory and healing properties on wounds, kidneys. Maximum amount of tannins were observed in the plants of *Ocimum sanctum* collected from Calicut in Kerala, compared to all the places studied (10.32%) The tannin content of the leaves were found to be maximum during winter season.10.3% tannins were observed in *O. sanctum* plants collected from Calicut during winter season while 9.78% tannin was observed in *O. sanctum* plants collected from Calicut during summer season. Gupta et al 1992 have also reported an increase in tannin content of *Toona ciliate* and *Phoenix acualis* during the winter season .

Many of the potential benefits of *Ocimum sanctum* are believed to be due to the ursolic acid content. Maximum amount of ursolic acid was observed in the plants of *Ocimum sanctum* collected from Calicut in Kerala(2.7%) and minimum amount was observed in plants collected from Mumbai (1.83%). Another observation made was that maximum amount of ursolic acid was observed in plants collected during winter, compared to plants collected in summer.

The vasicine content in *Adhathoda vasica* collected from various regions of Kerala was higher than the ones collected from Maharashtra. The maximum amount of vasicine was observed in the plants of *Adhathoda vasica* collected from Calicut in Kerala(91.13%)and a minimum of 0.18%was observed in plants of *Adhathoda vasica* collected from Mumbai. Another observation made was that the vasicine content observed in plants collected during summer and winter showed variation. Maximum content was observed during the winter season.

In the present investigation it was found that maximum amount of all the heavy metals studied was detected in Mumbai. This observation was recorded both in plants collected in summer as well as in winter. Arsenic however was not detected in any of the plants studied.

Conclusions

I].The ideal geographic location of Kerala and its salubrious climate has made Ayurvedic and the rejuvenation therapies, most effective in this place, called 'The cradle of Ayurveda' .Our present investigation supports this fact as the medicinal value with regard to all the active constituents i.e. vitamin C ,essential oils, vasicine content, ursolic acid content, flavonoids and tannin content of both *Adhathoda vasica* and *Ocimum* sanctum were found to be maximum in plants collected from Kerala as compared to the plants collected from various regions of Maharashtra.

ii].In Kerala, the plants collected from Calicut showed maximum amount of tannins, flavonoids, vasicine and ursolic acid. Thus it can be concluded that the plants of *Adhathoda vasica* and *Ocimum sanctum* collected from this place can give maximum benefit with regard to its medicinal properties.

iii].In Maharashtra, the plants collected from Nashik showed maximum amount of the medicinally important active constituents such as tannins, flavonoids, vasicine and ursolic acid as compared to plants of other places studied.

iv].The season of the year ideal for collection of the plant material would be winter as during this season, maximum amount of these medicinally important phyto-constituents are present in both the plants studied.

v] From the present investigation, it can be concluded that *Adhatoda vasica* Nees and *Ocimum sanctum* plants collected from Kerala are medicinally more useful as all the important active constituents such as Essential oils, Vitamin C, ursolic acid, flavanoids, tannins,and vasicine content of both these plants collected from Kerala were found to be maximum especially during the winter season probably due to the environmental conditions in this region which are conducive for it. Hence *Adhatoda vasica* Nees and *Ocimum sanctum* growing in these regions should be selected for medicinal preparations for best results.

References:

Chopra, R.N. Nagar S.L and Chopra, I. C (1956):In glossary of Indian medicinal plants, council of scientific and industrial research, New Delhi 1:197

Chopra R. N. (1982). Indigenous drugs of India. Academic publishers Calcutta pp 264-266. Nadkarni K . M.(1954) The Indian Materia Medica, I:40-4.

Gupta et. al., 1992. Seasonal variation in antiquality factors of Leucaena leucocephala in India. Leucaena Res. Reports. 13:26-28

Iftikhar Ahmad (2011) spatio-temporal variations in some medicinally important biochemical constituents of peganum harmala (hermal) Pak. J. Bot ., 45(S1): 601-607, January .

Ram Swaroop Verma et. al. (2011) Chemical composition and antibacterial activity ofessential oil from two *Ocimum* spp grown in sub tropical India during spring-summer cropping season Journal of Traditional Medicines, 6 (5)

Sharma et. al. (2012), Evaluation of antioxidant activities of Withania somnifera leaves growing in natural habitats of North west Himalaya, India, Journal of Medicinal Plants Research Vol. 6(5), pp. 657-661, 9 February

Shankar Mandal, Bijay R Mirdka and Sushil C. Mohaptra.(2009) The science behind the sacredness of Tulsi (ocimum sanctum Linn) Indian J physiol pharmacol, 53(4) 291-306.

Sivarajan, 1994, Book: Ayurvedic Drugs and Their Plant Sources, Volume 11,Issue, June, Pages 59–77

Sunita Maurya and Dhananjay Singh (2010) Quantitative analysis of flavonoids in Adhatoda Vasaca extracts Der. pharma chemical,2 (5) :242-246.