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VARIATION IN CALORIFIC VALUE OF SEEDS OF *Adhatoda vasica* FOUND AT DIFFERENT SITES IN AND AROUND BHOPAL MADHYA PRADESH

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ABSTRACT

***Adhatoda vasica* is one of the medicinal plants of immense medicinal value. This plant is useful in asthma, bronchitis, chronic cough, controlling pain, inflammation and cold etc. The present work is based on detailed study of biochemistry, seed biology and regeneration of *Adhatoda vasica*. After careful survey of region five study sites have been selected for the present study from in and around Bhopal Madhya pradesh. Calorific value of seeds of *Adhatoda vasica* was determined and effect of ecological conditions on calorific value of seeds was observed and analyzed in the present work. The energy content of seed is determined by bomb calorimeter. The heat combustion in Kcal/gram of oven dried weight of seeds is 5.52Kcal/gram. Maximum calorific value is found in seeds collected from Motilal Vigyan Mahavidlaya campus Bhopal, Madhya Pradesh and value of seeds collected from Vidisha Madhya Pradesh area is least.**

KEYWORDS : *Adhatoda vasica*, Calorific Value, Inflorescence, Ecological Conditions, Bronchitis, Asthma

Adhatoda vasica Nees syn. *Adhatoda zeylanica* Medik, syn. *Justicia adhatoda* Linn belongs to family Acanthaceae is a well-known plant drug in Ayurvedic and Unani medicine (Thokchom et al., 2011). The plant *Adhatoda vasica* is known as "Malabar Nut" in English which is a misnomer. Its genus name is derived from a south Indian language(Tamil), meaning-plant not touched by goat, for "Aadu" means goat' and "toda" means not touched in tamil. Genus *Adhatoda* was earlier placed in genus *Justicia. Justicia* L. (Sensu lato) consists of more than 300 species distributed throughout the world, exhibiting immense range of variations in the vegetative as well as floral features. *Adhatoda vasica* is an evergreen gregarious, stiff, perennial shrub, 1.5-3.0 m height distributed throughout India .It is a source of drug 'vasak" well known in the indigenous system of medicine for its beneficial effects particularly in bronchitis, asthma, fever and tuberculosis. The plant has been reported to have high medicinal value (Basu et al., 2011, Shanbhag and Khandagle, 2010). Methanolic extract was effective as an antityphoid agent against *Salmonella typhi* (Kumar et al., 2013). The leaves and roots are antispasmodic and efficacious in coughs. According to Krishnaswamy and David (1940) the drug is useful as an expectorant and is mild brochial antispasmodic. The leaves contain very small amount of an essential oil, a crystalline acid and a white crystalline quinazoline alkaloid vasicine. Therapeutic properties were attributed to vasicine and the essential oil. Mass spectra of vasicine from young inflorescence were reported from Pakistan (Ikram et. al., 1965). Four new quinqzoline alkaloids- vasicoline, adhatodine, vasicotinone and anisotine were isolated by (Jhone et al., 1973). In 1979 Vasicinone from inflorescence was reported. It has also proved useful for the control of postpartum hemorrhage Nath et al., 1992, Chandoke et al., 1987, Atal et al., 1982, Cleason et al., 2001). During the last 25 years several scientific reports on oxytocic and abortefacient effect of *Adhatoda vasica* have appeared in research journals. This led to the questions concerning the safety of *Adhatoda vasica* as an herbal medicine. Cleason et al. 2001 have reviewed and commented upon the major data on traditional uses as well as ethno pharmacological and toxicological studies. They have evaluated the data from the point of view of correctness, reliability, relevance and importance, for the overall evaluation of safety of *Adhatoda vasica* use. Due to strong insecticidal properties, *Adhatoda vasica* has been recommended as an alternative for synthetic insecticides in the management of field populations of many insects harmful to crops. Bioefficacy of aqueous plant extract on viability of eggs, subsequent development, longevity and fecundity of tea mosquito bug, *Helopltis theivaro* was evaluated; significant ovicidal and longevity inhibition was reported. The extract was also found to have antifeedent and oviposition deterrent effect (Deka et al., 1999).

In a leading article on "cultivation conservation and sustainable utilization of medicinal plants through

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people's participation"A case study (Binu, Shanavaskhan and Santosh) medicinal plants whose conservstion and regeneration is to be promoted. Due to tremendous medicinal value, the demand for the plant has considerably increased both within and outside the country. Its indiscriminate use has led to large scale depletion in the wild and has necessitated its replenishment and cultivation. Regeneration studies in *Adhatoda vasica* is comparatively a recent phenomenon. Modak et. al. (1990) has demonstrated the effect of exogenously applied sucrose on rooting of *Adhatoda vasica*. Human beings require number of complex organic compounds as added caloric requirements to meet the need for their mascular activities, carbohydrates, fats and proteins, while minerals and vitamins form comparatively a smaller part, plant materials form a major portion of diet their nutritive value is important (Indrayan et al., 2000). Nutritive value of leaves of *Adhatoda vasica* was assessed to be 106.00 cal/100g. Human beings require number of complex organic compounds as added caloric requirements to meet the need of their muscular activities, carbohydrates, fats, and proteins, while minerals and vitamins form comparatively a smaller part, plant materials form a major portion of diet, their nutritive value is important (Benton, 1972, Indrayan et al., 2000). As is evident from the review that abundant research work has been carried out on the organic constituents of the medicinal plants while little attention has been paid on the role of inorganic elements in the medicinal use and seed biology studies of *Adhatoda vasica* (Mohanta et al., 2003, Sharat et al., 2010), hence the present work was envisaged and planned.

MATERIALS AND METHODS

In the present study, estimation of calorific value has been undertaken from the seed samples collected from the diverse experimental sites. For the present study, area in and around Bhopal (M.P.) was thoroughly surveyed for recording occurrence of *Adhatoda vasica* and selection of study sites where it was growing in wild conditions. Five sites were finally selected based on the consideration that they represented all types of areas where *Adhatoda vasica* grew naturally. The five sites so selected are:

Site-1: Govt. Motilal Vigyan Mahavidyalaya Campus, Bhopal, M.P.

Site-2: Lake view area along Upper Lake, Bhopal, M.P.

Site-3: Islamnagar Fort, Islamnagar, Bhopal, M.P.

Site-4: Raisen Fort, Raisen, M.P.

Site-5: Vidisha along state highway about 2 km. towards Sanchi, M.P.

Due to its typical fruit dehiscence and seed dispersal mechanism it was difficult to collect seed in large amounts. Hence, at each site 25 bushes were selected randomly and on them 100 inflorescence (4 per bush) were bagged using muslin cloth. Young buds and unopened flowers were removed from the inflorescence before bagging to ensure uniformity in seed size. The seed lots so collected were numbered and stored in bulk. From it working samples were taken for various studies to work upon for biochemical investigations, working samples were taken from the seed lot. The working sample is a representative sample suitable for use in which the probability of a constituent present is determined by its level of occurrence in the seed lot. This sampling was done by the soil type divider each working sample constituted of 25 seeds and three replicate of such sample were used for each treatment/investigation.

The seeds after drying in hot air oven at 8^0c for 24 hours were powdered with the help of hand mortar and pestle. The powder was then sieved through a 0.5mm sieve. Pellets of nearly one gram were prepared from the powder. These pellets were again dried in a hot air oven from where they were transferred to desiccators. These pellets were burnt in an oxygen bomb calorimeter. The analysis was made in triplicate. However no correlations have made either for the fuse wire burnt or for the acids formed during combustion. The calorific values have been expressed in terms of Kcal/gm. Dry weight.

The following formula is used in calculation.

C = (W1xt) + (W2xt) / W Kcal /gm of oven dry weight basis.

RESULTS AND DISCUSSION

Economic importance of any plant depends on its energy content which is calculated as calorific value. To

Table 1 : Calorific value of seeds of *Adhatoda vasica*

S. No	Habitats	Calorific Value(Kcal/gm)
1	MotilalVigyan .Mahavidyalaya Area, Bhopal (M.P.)	Mean = 5.522 SD = ±0.006 SE = ±0.003
2	Upper Lake Area Bhopal (M.P.)	Mean = 4.960 SD = ±0.025 SE = ±0.014
3	Islamnagar Area Bhopal (M.P.)	Mean = 5.517 SD = ±0.001 SE = ±0.001
4	Raisen Area (M.P.)	Mean = 4.830 SD = ±0.002 SE = ±0.003
5	Vidisha (near sanchi) (M.P.)	Mean = 4.624 SD =± 0.004 SE= ±0.002

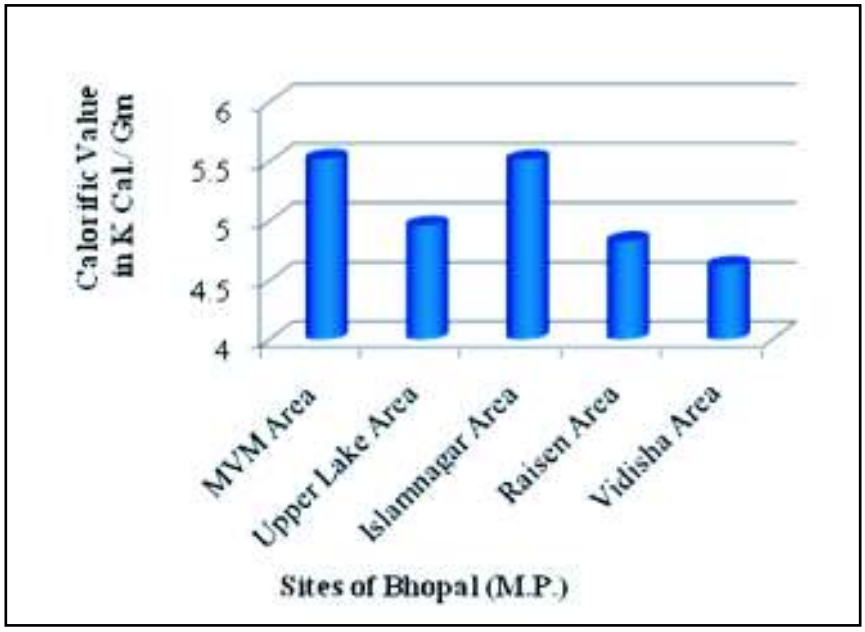

Figure 1: Variation in Calorific Value of Seeds of *Adhatoda vasica*.

determine the calorific value of seed of *Adhatoda vasica*, this aspect was included in present work. The energy content of seed is determined by Bomb Calorimeter and energy content is expressed in Kcal/gram. Calorific value is calculated for seeds of *Adhatoda vasica* collected from five sites.

The heat combustion in Kcal/gram of oven dried weight of seeds of *Adhatoda vasica* is given in (Table 1 and Figure 1). Maximum energy content is found in seeds collected from Motilal Vigyan Mahavidyalaya campus and value of seed collected from Vidisha area is least. Energy value of seeds collected from different sites can be depicted as Kcal/gm. All the calorific value were compared and taken for significance with "t" test and 5% probability level .A point of note is that Calorific value of samples taken from MVM site is quite large as compared to other study sites (Figure 1). This could be partly explained due to better soil nutrient status and water availability in this site which is

relevant with the findings of (Garg et al., 2007; Devi et al., 2008) that the variations in these attributes generally appeared to be strongly affected by an increase in plant age as well as changes in environmental conditions during different seasons (Ahamad et al., 2011).

CONCLUSION

The energy content of the seeds was found to vary from site to site with maximum energy content shown by MVM campus seeds and minimum by seeds from Vidishia area near Sacchi.

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