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PHYTOCHEMICAL ANALYSES IN*SCHWEINFURTHIAPAPILIONACEA*(LINN.) DURING DIFFERENT DEVELOPMENTAL STAGES FROM THE INDIAN ARID REGION

RAJESH KUMAR and PAWAN K. KASERA*

Laboratory of Plant Ecology, Department of Botany, Center of Advanced Study
Jai Narain Vyas University, Jodhpur 342005, India
*Corresponding Author E-Mail: pkkasera1963@gmail.com; jnvupkkasera@yahoo.co.in

The present study deals with phytochemical analyses in *Schweinfurthia papilionacea,* an important medicinal plant of the Indian Thar desert. The experiments were conducted at Plant Ecology Laboratory, Botany Department, J.N.V. University, Jodhpur during 2020 and 2021.Primary metabolites such as leaf pigments, proline, osmotic potential, total sugars, crude protein and phosphorus were estimated during different developmental stages, i.e. vegetative, flowering and fruiting. The results revealed that leaf pigments, crude protein and phosphorus were maximum during flowering stage, while proline, osmotic potential and total sugars during fruiting stage.

Keywords: Crude protein, Leaf pigments, Sugars,Medicinal plant, Phosphorus, Thar desert

Introduction

Medicinal plants have been used in healthcare since time immemorial. Plants provide major source of molecules with medicinal properties due to presence of natural compounds. They are useful for curing human diseases and play an important role in healing due to presence of phytochemical constituents[1].India is endowed with a rich wealth of medicinal plants. Plants are like natural laboratories where a great number of chemicals are biosynthesized and they may be considered the most important source of chemical compounds[2].

*Schweinfurthia papilionacea*Linn. (Family: Scrophulariaceae)iscommonly known as Sanipat. Itsdistribution is restricted to rocky and gravelly soil of north-west Rajasthan. It is a dwarf glaucous herb with 15-30 cm height. The powdered leaves and fruit are sold as a drug, which is prescribed by vaids in typhoid fever. It is also used as stuff for bleeding in the nose[3].

Primary metabolites, viz. chlorophylls, amino acids, nucleotides and carbohydrates have a key role in metabolic processes such as photosynthesis, respiration and nutrient assimilation.Many primary metabolites lie in their impact as precursors or pharmacologically active metabolites in pharmaceutical compounds. Plant synthesizes primary metabolites (lipid, protein, starch, sugar, etc.) for the normal growth and development of itself. They are also used as raw material and food additives[4].No reports are available on phytochemical analyses in this important medicinal plant of IndianThar desert. Thus, the present study was conducted to estimate the primary metabolites such as leaf pigments, proline, osmotic potential, total sugars, crude protein and phosphorus during different developmental stages, i.e. vegetative, flowering and fruiting, so that suitable stage can be evaluated to harvest this plant to obtain maximum amount of

commercially important primary metabolites.

Material andMethods

For chemical analyses of plant, leaf samples were collected randomly from Bada Bagh, Jaisalmer (26^0 56' 8.052" N and 70^0 53' 49.416" E),which is located 287 km away in western direction from the University Campus, Jodhpur during three developmental stages, viz.vegetative (July to September), flowering (October to December) and fruiting (December to March) during2020 and 2021.The identity of plants was confirmed by the Botanical Survey of India, Jodhpur and specimens have been deposited in BSI herbarium. Plant materials were washed with running tap water to remove the adherent foreign particles, air-dried and further used for chemical analyses. Leaf pigments, osmotic potential and proline were estimated in fresh leaf samples, while otherparameters from oven-dried leaves. Fresh leaves were extracted with 80% acetone for estimation of leaf pigments as per Arnon[5]. Free proline and osmotic potential were estimated as per Bates et al.[6] and Janardhan et al.[7], respectively. The total sugars were estimated as per standard methods given by Plummer[8], while nitrogen by Microkjeldahlapparatus as suggested by Peach and Tracey[9] and phosphorus as per Allen et al.[10].Experiment for each parameterwas performed in triplicate and confirmed twice.

The data collected during both the years (2020 and 2021) were subjected to analyses of variance (ANOVA) as suggested by Gomez and Gomez[11] and mean values are presented in tabular form.

Resultsand Discussion

The data on leaf pigments, proline, osmotic potential, total sugars, crude protein and phosphorus during different developmental stages in *S. papilionacea*are presented in Table 1. It is evident from this Table that the highest values of total chlorophylls and carotenoids were observed during flowering stage. Kedia et al.[12]and Kasera et al.[13]reported highest values of leaf pigments during flowering stage in *Phyllanthus fraternus*and*Dipcadi erythraeum,* respectively which is in accordance with present findings.

The proline values varied from 0.282 to 2.37 µg g^{-1} fresh weight during three stages, being maximum in fruiting stage. Kasera et al.[13] recorded maximum accumulation of proline at fruiting stage in *Corbichoniadecumbens.* Shukla et al.[14] reported highest value of osmotic potential when proline content was at peak in *Prosopis cineraria* and similarly in the present study it was maximum with maximum proline accumulation. The present findings also accord with the above observations.

Plant sugars can be used as artificial sweeteners and they can even help diabetics by supporting the body in its rebuilding[15]. Total sugar values ranged from 9.34 to 17.63 mg g^{-1} dry weight during three phases and maximum was reported in fruiting stage. Sagar and Kasera[16] observed maximum values of total sugars during fruiting stage in *D. erythraeum*. Daiya and Kasera[17] also reported highest level of total sugars during fruiting stage in *C. decumbens*, which is in accordance with present study.

The presence of higher protein level in the plant points towards their possible increase food value or that a protein base bioactive compound could also be isolated in future Thomsen et al.[18].Crude protein was observed highest (11.97 % dry weight) during flowering stage. Saharan et al.[19] reported maximum protein contents during flowering as compared to seedling and vegetative stages in *Evolvulus alsinoides*. Kedia et al.[12]also reported highest protein content during flowering stage in *P. fraternus,* which confirm present findings.The highest phosphorus (P)content was

Table 1. Analyses of variousparameters in *S. papilionacea* during three developmental stages (values are average of six replicates).

Parameters	Developmental stages			CD
	Vegetative	Flowering	Fruiting	
Chlorophyll *a* (mg g^{-1} f. wt.)	0.486	0.524	0.343	0.0785^{ns}
Chlorophyll *b* (mg g^{-1} f. wt.)	0.269	0.245	0.165	0.0632^{ns}
Total Chlorophylls (mg g^{-1} f. wt.)	0.755	0.770	0.509	0.1104^{ns}
Carotenoids (mg g^{-1} f. wt.)	0.000715	0.000766	0.000577	0.00011^{ns}
Proline (µg g^{-1} f. wt.)	0.282	1.16	2.37	0.433^{*}
Osmotic potential (-MPa)	1.332	1.338	1.282	0.346^{ns}
Total sugars (mg g^{-1} d. wt.)	13.32	9.34	17.63	3.099^{*}
Crude protein (% d. wt.)	9.63	11.97	9.09	2.26^{ns}
Phosphorus (% d. wt.)	0.163	0.252	0.243	0.0915^{ns}

* = significant at $p<0.05$ probability level; and ns = non-significant.

recorded during flowering stage in the present studies. *C. decumbens*showed highest phosphorus content during fruiting (maturity) stage followed by flowering and minimum at vegetative stage[13]. On the contrary, in the present studies it was maximum at flowering stage. The uptake of P by plants is influenced by the availability of nitrogen. The highest P content in flowering stage may be due to high level of available nitrogen in the soil.

ANOVA showed that data onproline and total sugars were significant at $p<0.05$ during three developmental stages, while remaining parameters were non-significant.

By estimating primary metabolites during different developmental stages to find out most suitable stage for obtainingmaximum amount of these products for commercial importance was the main objective of present studies. Thus, it is concluded from present studiesthat leaf pigments, crude protein and phosphorus were accumulated in the highest amount during flowering phase of *S. papilionacea,* while remaining parameters during fruiting stage.

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