

TOTAL FREE PROLINE ESTIMATED IN SOME SELECTED SPECIES OF PTERIDOPHYTIC FLORA OF RAJASTHAN

ABSTRACT

Proline, a well-known amino acid, is estimated in 10 selected species of pteridophytes, including *Adiantum capillus-veneris* L., *Adiantum caudatum* L., *Adiantum incisum* Forssk., *Adiantum philippense* L., *Actiniopteris radiata* (Sw.) link. Christenh. in different organs such as root, rhizome, and leaves. *Hemionitis anceps* (Blanf.) Christenh., *Hemionitis bicolor* (Roxb.), *Hemionitis formosana* (Hayata), Christenh., *Hypodematium crenatum* (Forssk.) Kuhn and Decken, *Pteris vittata* subsp. *vittata* was employed in this study. Result of study is revealed that the maximum total proline in entire plant was recorded in *Pteris vittata* subsp. *vittata* and the minimum value was recorded in *Adiantum caudatum* L.

Key words: Kumbhalgarh Wildlife Sanctuary, Proline, Sulphosalicylic acid

INTRODUCTION

The phytochemistry of Rajasthan pteridophytes has been taken up for the first time by Bhardwaja et al. 1977 who have reported five steroidal compounds (sitosterol cholesterol, stigmasterol and two unknown) from sporocarps of *Marsilea minuta* L. (Syn. *Marsilea diffusa* Lepr. ex A. Braun) and proposed a role for them in the pronounced survivability of *Marsilea* L. megaspores and microspores. Sharma and Vyas (1988) studied the phytochemistry of 14 pteridophyte taxa, including *Marsilea inuta* and *Marsilea aegyptiaca* Willd. Sharma and Sharma (1992) studied the flavonoids in seven common ferns of Rajasthan. Moore and Stein, 1948; Rathore and Sharma, 1968;

Bates et al. 1973; Bhardwaja, 1986; Shankar and Khare, 1985; Kaur et al. 1986; Shankar and Khare, 1986; Khair and Shankar 1987; Rathore and Sharma 1988; Vyas and Sharma, 1988; Vyas, 1988; Vyas, 1989; Sharma, 1989; Vyas et al. 1989; Rathore and Sharma, 1990; Yadav, 1990; De Britto et al. 1992; Gopalakrishnan et al. 1993; Hopkins et al. 2001; Ramchandran et al. 1991; Rathore and Sharma, 1991; Rathore and Sharma, 1992; Verma, 1992; Yadav, 1992; Sharma et al. 1995; Louis et. al. 2001; Henry et al. 2003.

Total free proline of different organs such as root, rhizome and leaves in 10 selected pteridophytic specie which is

Comment [11]: Sentence can rewrite by including all ten plants in a single sentence. Example: is estimated in different organs such as in 10 selected species of pteridophytes including (all species).

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collected from Kumbhalgarh wildlife sanctuary of Rajasthan are namely *Adiantum capillus-veneris* L., *Adiantum caudatum* L., *Adiantum incisum* Forssk., *Adiantum philippense* L., *Actinopteris radiata* (Sw.) Link., *Hemionitis anceps* (Blanf.) Christenh., *Hemionitis bicolor* (Roxb.) Christenh., *Hemionitis formosana* (Hayata) Christenh.; *Hypodematium crenatum* (Forssk.) Kuhn & Decken, *Pteris vittata* subsp. *vittata*. taken up for investigation of proline content for present paper.

MATERIALS AND METHODS

Estimation of free proline was carried out following method suggested by Bates *et al.* (1973). After homogenising 200 mg of plant material with in sulphosalicylic acid and centrifugation, the supernatant was utilised to calculate free proline. 2 ml glacial acetic acid and 2 ml Ninhydrin reagent were combined with a suitable quantity of aliquot (1 ml in this example). Before being put in an ice bath, the test tubes were submerged in boiling water for 45 minutes. 4 mL toluene was poured into each test tube and shaken vigorously. A separating funnel was used to separate the upper pink-colored organic phase. At 540 nm, optical density was measured. Pure proline was used to create the standard curve.

RESULTS

Proline was estimated in different organs i.e., leaf, rhizome and root of plants of same age of 10 selected pteridophytic species from Kumbhalgarh Wildlife Sanctuary of Rajasthan. The results have been shown in Table - 1 and Text Fig. 1.

The highest proline concentration in the leaf was found in *Pteris vittata* subsp. *vittata* (24.10 mg/gdw), followed by *Actinopteris radiata* (Sw.) Link. (21.24 mg/gdw) and *Hemionitis formosana* (Hayata) Christenh. (20.64 mg/gdw), while the lowest was found in *Adiantum capillus-veneris* L. (11.76 mg)

In rhizome, *Hemionitis anceps* (Blanf.) Christenh. had the highest proline concentration (15.76 mg/gdw), followed by *Hemionitis formosana* (Hayata) Christenh. (13.72 mg/gdw) and *Actinopteris radiata* (Sw.) Link. (12.24 mg/gdw), with the lowest concentration (4.10 mg/gdw) in *Adiantum capillus-veneris*.

Actinopteris radiata (Sw.) Link. had the greatest proline concentration in root (8.80 mg/gdw), followed by *Pteris vittata* subsp. *vittata* (8.40 mg/gdw) and *Hemionitis anceps* (Blanf.) Christenh. (8.16 mg/gdw), with *Adiantum caudatum* L. having the lowest (3.60 mg/gdw).

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The highest proline concentration in the entire plant was found in *Pteris vittata* subsp. *vittata* (43.54 mg/gdw), followed by *Actiniopteris radiata* (Sw.) Link. (42.28 mg/gdw) and *Hemionitis formosana* (Hayata) Christenh. (42.08 mg/gdw), while the lowest was found in *Adiantum capillus-veneris* L. (20.3 mg/gdw).

DISCUSSION

The highest levels of proline were found in the leaves, followed by the rhizome, and the lowest levels of proline were found in the roots. Proline, a well-known amino acid that has been labelled as a drought indicator, has been discovered in higher quantities in taxa that can endure harsher conditions for longer periods of growth, such as *Pteris vittata* subsp. *vittata*, *Actiniopteris radiata*, and *Hemionitis* species.

Many studies have been conducted to illustrate the significance of proline accumulation in angiosperms under water stress conditions (Kemble & Macpherson, 1954; Barnett & Naylor, 1966). Kaur et al. (1986), Gena et al. (1988), and others have reproduced these findings in Rajasthan pteridophytes (1987). They observed that proline concentration in ferns grown under stress is greater than in ferns cultivated in shade and wetness. Drought-resistant ferns

have more proline than aquatic or moisture-loving species, according to Sharma and Rathore (1988). In his research of Rajasthan pteridophytes, Yadav (1990, 2006) revealed that proline concentration is greater in ferns growing in dry conditions than in ferns growing in humid conditions. As a result, free proline in Rajasthan ferns can be utilised to forecast drought behaviour. Taxa that develop in generally dry settings have greater proline levels than taxa that grow in shadow and wet conditions, according to the current study. Thus, *Pteris vittata* subsp. *vittata*, *Actiniopteris radiata*, and *Hemionitis formosana* with standing drought conditions for lengthy periods of growth have a greater proline content, but *Adiantum caudatum* has a lower proline content.

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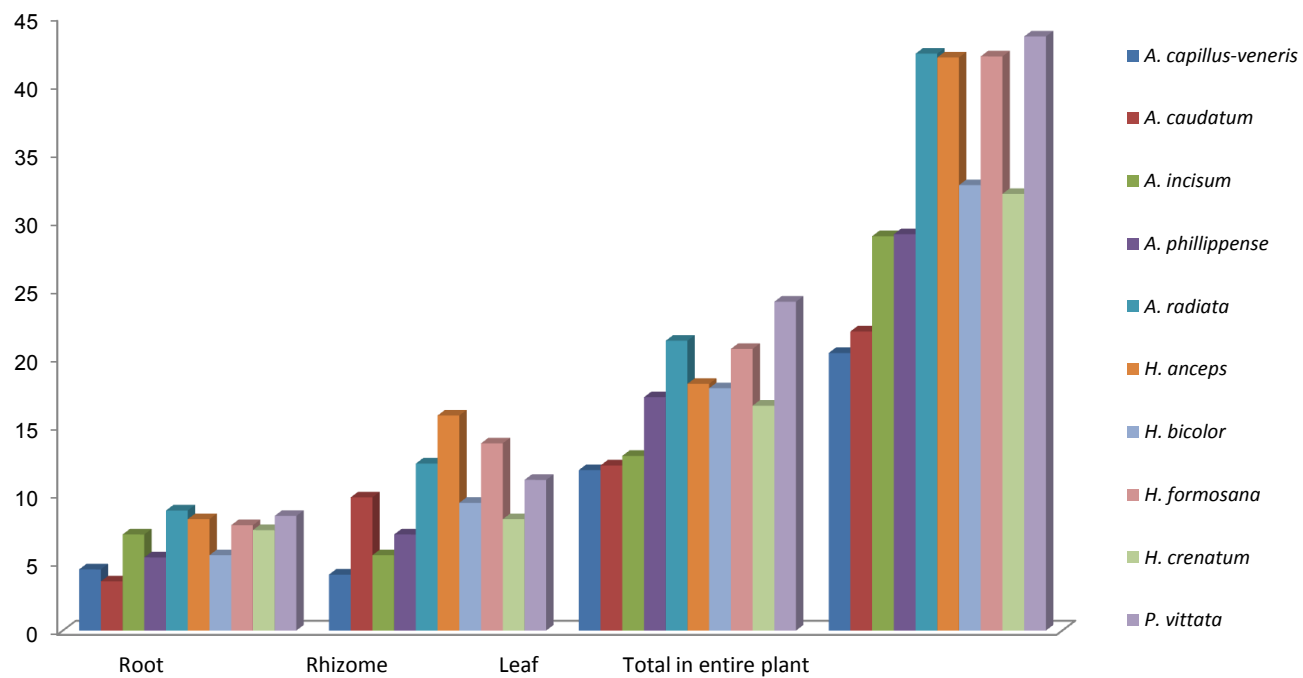
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TABLE -1

TOTAL FREE PROLINE (mg/gdw) IN DIFFERENT ORGANS OF SELECTED SPECIES OF PTERIDOPHYTES FROM KUMBHALGARH WILDLIFE SANCTUARY OF RAJASTHAN

S. No.	Name of species	Root	Rhizome	Leaf	Total in entire plant
1.	<i>Adiantum capillus-veneris</i>	4.48	4.10	11.76	20.34
2.	<i>Adiantumcaudatum</i>	3.60	9.76	12.10	21.92
3.	<i>Adiantum incisum</i>	7.04	5.52	12.8	28.90
4.	<i>Adiantumphilippense</i>	5.36	7.04	17.10	29.05
5.	<i>Actiniopteris radiata</i>	8.80	12.24	21.24	42.28
6.	<i>Hemionitis anceps</i>	8.16	15.76	18.08	42.00
7.	<i>Hemionitis bicolor</i>	5.52	9.36	17.76	32.64
8.	<i>Hemionitis formosana</i>	7.72	13.72	20.64	42.08
9.	<i>Hypodematium crenatum</i>	7.36	8.16	16.48	32.00
10.	<i>Pteris vittata</i> subsp. <i>vittata</i>	8.40	11.04	24.10	43.54

TEXT FIG. - 1
TOTAL FREE PROLINE (mg/gdw) IN DIFFERENT ORGANS OF SELECTED SPECIES OF PTRIDOPHYTES FROM KUMBHALGARH WILDLIFE SANCTUARY OF RAJASTHAN



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