WORLD JOURNAL OF PHARMACEUTICAL RESEARCH
SJIF Impact Factor 5.045
Volume 3, Issue 5, 936-944. Research Article ISSN 2277 – 7105

PROSPECTS OF STUDIES ON *TEPHROSIA PURPUREA* L. FOR SEED CHARACTERS AND SEED MORPHOLOG IN VINDHYA REGION

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Article Received on
22 May 2014,

Revised on 17 June 2014,
Accepted on 11 July 2014

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ABSTRACT

The plant *Tephrosia purpurea* L. of the family papilionanceae had been investigated for certain of its pharmacologically active phytoconstituents. The perusal of literature, however revealed that not much attention was given to the phytosocilogy of the species in the various climatic and phytogeographical areas. In the present study, *Tephrosia purpurea* and its associates have been recorded in the four districts viz. Rewa, Satna, Sidhi and Shahdol of the Vindhyan region with special reference to seed characters and seed germination physiology.

KEY WORDS: *Tephrosia purpurea*, Seed germination, Vindhyan region etc.

INTRODUCTION

Tephrosia purpurea is a commonly occurring weedy plant in the ecosystem, where there is competition for water. It grows only in the rainy season and passes the dry season in the form of speed [1]. The xerophytic leaves differ from mesophytic ones in thickness. The predominant ecomorphological character: Transpiration coefficient is 1108 for producing equal amounts of dry matter; the weeds transpire more water than crop plants which is certainly of concern to the farmers in dry lands agriculture. In view of the huge water loss, the primary emphasis of the marked quantitative ecomorphological differences in the frequency of stomata, epidermal cells and palisade ratio in the two habitats and to establish the relationship through coefficient of correlation between the length of lamina and these parameters [2, 3].The stomata have been arranged irregularly throughout the length of lamina

and are anisocytic type. The number of stomata per unit area especially the stomata index and palisade ratio not differ due to the changes in the soil moisture and external water treatments in varieties of wheat. Stomata tend to be smaller and more on leaves developed in full sun and dry habitats [4,5,6].

The abnormalities which are more common in floral parts have also been rarely observed in the vegetative regions. The inflorescence in the normal plants of *Tephrosia purpurea* linn is 3-15 cm long, lax and hairy raceme. In plants bearing abnormal flower such inflorescence become considerably smaller due to the shortening of floral axis. In addition to this, in a few cases, the flower become fascicled and the whole inflorescence appears to be much crowded [7,8].

The most common as well as the most significant abnormality has been noticed in the proliferation of flowers often show the production of distinctly pedicellate flower often show the production of distinctly pedicellate flower within the sepals of the proliferated flowers. Sometime instead, a normal pinnate compound leaf or casually a small condensed branch may develop within a flower. Rarely the proliferation has gone to the extent of producing number of branches or even the entire condensed inflorescence may be produced within the calyx of proliferated flowers [9,10]. The calyx which, in the normal flower, consists of five green, linear sepals, increased in number in abnormal flowers. As many as nine sepals have been observed in few flowers. These sepals not only become enlarged in size but become further unequal in length and remain more or less incurved asymmetrically [11].

The area of the present work extends through various startigraphic terrains belonging to a wide span of geological events. The geological age of the various rocks that occur within the periphery of the region some of these rocks are ranging in age from 2500 m.yr. or more while the rocks of volcanic origin formed nearly 60 m.yr. ago are also found. Thus, almost all the important stratigraphic columns of the Indian shield are represented here. Rocks of the Vindhyans super group occur in all the four districts of the area of investigation. It is interesting to note that Williams (1848) made the first survey to identify the black formations (Vijayagarh shale) west of the Sone river valley which were until then supposed to be coal seams. Oldham (1856) carried out a systematic study and grouped the rocks in “Vindhyan system”. A lot of work has been done on the various aspects of these rocks over the past fourteen decades [12].

The geology of the region which encompasses four districts is as follows:

Era Recent	Alluminium Laterite	Shahdol, Sidhi Rewa , Satna
Mesozoic/ Early Tertiary/ Palaeozoic	Deccan Traps Lametas Upper Gondwana	Shadol Shadol Shadol
Early/ Palaezoic	Upper vindhyans Lower Vindhyans	Rewa,Satna Shahdol Sidhi, Shadol
Precambrian/ Purana Archaean	Bijawar Crystalline complex Greisses & Schists	Sidhi, Shahdol Sidhi Shahdol

MATERIALS AND METHODS

Average seed output for plant was calculated as per method suggested by Pandey et al., 1968 and seeds were collected from healthy mature fruits of *Tephrosia purpurea* [13]. The details of each of the studies are given below.

Seed size

Ten seeds from all different places were selected at random. Seeds were mounted on slides and measurement of length and breadth was taken under a travelling microscope fitted with a vernier scale. On the basis of the data obtained, average length and breadth was calculated. Length/Breadth ratio was also calculated.

Seed weight

Ten seeds from each of the four places viz. Rewa, Satna, Sidhi and Shahdol were selected at random and then their weight was determined on a single pan chemical balance. The average weight of a single seed was calculated.

Seed volume

Seed volume was determined by modifying the water displacement method as the seeds showed a tendency to float when put in water, ten assorted seeds from all of the four different places were taken in a dry graduated cylinder of 10 ml. capacity. This cylinder was filled exactly up to the 10 ml. mark, first with the help of a pipette of 5 ml. capacity and then with a micropipette of 2 ml. capacity. The volume of water poured into the cylinder was noted. This was deducted from 10 ml. The remainder represented the volume of 10 seeds. Ten such readings were taken and the average volume of one seed was derived.

Seed output

Separate plants from the different places were selected at random and the plants were tagged for observation, seeds of each tagged plant were counted directly from the data obtained mean seed output per plant was calculated.

Reproductive capacity

The reproductive capacity was calculative using the following formula of Salisbury (1942) [14]. Reproductive capacity = $\frac{\text{Average seed output}}{100}$ X average of seed production capacity

RESULTS

Morphology of seed

Seed morphology depicts the sum total effects of various stresses and strains, which the species has been subjected to during the evaluation, in its specified habitat of origin. Seed characters; originate due to interaction of various environmental conditions prevailing in the habitat of the plant. These are correlated with the survival and dispersal of the species. Pandey et al., (1968) stressed that morphology of seed is an important – character in assessing the mode and extent of dispersal of species [13].

Shape of seed

Seed (3)-6-(7) per pod, oblong or very slightly compressed laterally, ends rounded; surface smooth, purpulish with dark mottling giving variegated appearance. Hilum excentric; hilum cushion of dark brown line; caruncle white covering hilum cushion, palisade ridge present; mircropyle and parahilum conspicuous; cotyledons ridge absent; sclerenchyma bundle 0.17 mm long and 0.2 mm wide.

Size of the seeds

Ten lots of seeds of different localities viz. Rewa, Satna, Sidhi and Sahdhol were collected at random for measurement of the size of seeds. The length and breadth of the seeds were measured under a travelling microscope. Results are tabulated in tables 1,2,3 and 4.

Seed weight

For the purpose of calculating seed weight ten seed were collected randomly from chosen plants, from each different sites viz. Rewa, Satna, Sidhi and Shahdhol. Each seed was weighed carefully on a chemical balance. Average weight was also calculated in different sites. The results are tabulated in table 5.

Seed volume

Seed volume was measured by water displacement method. 10 lots of 10 seeds from different localities viz. Rewa, Satna, Sidhi and Sandhol were taken and volume calculated from the average of readings obtained and tabulated in the table 6.

Seed output

Seed output is the total no of seeds produced by a plant in one season. Mishra (1968) and Mishra (1964) pointed out that seed output indicate the amount of energy passed by a plant to next generation as most of the species perpetuate, multiply and disperse through seeds [15,16]. There were 3 to 7 seeds per pod in Tephrosia purpurea. The seeds were counted in 10 different plants randomly selected from separate localities in rewa, Satna, Sidhi and Shahdol districts. The record is tabulated in table 7.

Table 1- Record of length and breadth of seeds of *Tephrosia purpurea* in locality of Rewa.

S. No.	Length (mm)	Breadth (mm)	L/B ratio
1	5.5	2.7	2.03
2	5.1	2.5	2.04
3	5.2	2.7	1.9
4	4.8	2.4	2.0
5	4.3	2.16	1.99
6	4.89	2.44	2.0
7	5.22	2.59	2.01
8	5.46	2.73	2.0
9	4.99	2.47	2.02
10	5.12	2.54	2.01

Average length of the seed = 5.05 mm.

Average breadth of the seed = 2.52 mm.

Average size of the seed = 5.05 mm. × 2.52 mm.

Average L/ B ratio = 2.0

Table 2- Record of length and breadth of seeds of *Tephrosia purpurea* in locality of Satna

S. No.	Length (mm)	Breadth (mm)	L/B ratio
1	5.33	2.65	2.01
2	4.89	44	2.0
3	5.23	2.62	1.99
4	5.01	253	1.98
5	5.5	2.75	2.00

6	5.32	2.64	2.01
7	5.11	2.50	2.04
8	5.25	2.67	1.96
9	5.01	2.50	2
10	4.97	2.47	2.01

Average length of the seed = 5.16 mm.

Average breadth of the seed = 2.57 mm.

Average size of the seed = 5.16mm. × 2.57mm.

Average L/B ratio = 2.0

Table 3- Record of length and breadth of seeds of *Tephrosia purpurea* in locality of Sidhi

S. No.	Length (mm)	Breadth (mm)	L/B ratio
1	4.2	2.12	1.98
2	5.18	2.59	2.00
3	4.99	2.50	1.99
4	5.26	2.61	2.01
5	5.44	2.73	1.99
6	5.0	2.5	2.0
7	4.96	2.45	2.02
8	5.5	2.71	2.02
9	5.22	2.62	1.99
10	5.18	2.56	2.02

Average length of the seed = 5.09 mm.

Average breadth of the seed = 2.53 mm.

Average size of the seed = 5.09 mm. × 2.53 mm.

Average L/ B ratio = 2.00

Table 4- Record of length and breadth of seeds of *Tephrosia purpurea* in locality of Shahdol.

S. No.	Length (mm)	Breadth (mm)	L/B ratio
1	5.5	2.7	2.03
2	5.1	2.5	2.04
3	5.2	2.7	1.9
4	4.8	2.4	2.0
5	4.3	2.16	1.99
6	4.89	2.44	2.0
7	5.22	2.59	2.01
8	5.46	2.73	2.0
9	4.99	2.47	2.02
10	5.12	2.54	2.01

Average length of the seed = 5.13 mm.

Average breadth of the seed = 2.56 mm.

Average size of the seed = 5.13 mm. × 2.56 mm.

Average L/ B ratio = 2.00

Table 5- Record of seed weight calculated of *Tephrosia purpurea*

S. No.	Weight of the seeds in mg (Rewa)	Weight of the seeds in mg (Satna)	Weight of the seeds in mg (Sidhi)	Weight of the seeds in mg (Shahdol)
1	24.8	26.2	24.7	26.4
2	23.9	23.8	26.0	24.8
3	23.0	25.5	25.0	4.7
4	26.0	25.1	25.5	26.0
5	25.50	24.4	24.2	25.4
6	25.80	25.7	22.9	25.9
7	25.50	26.1	26.2	25.2
8	24.40	24.40	26.0	24.9
9	26.10	24.7	25.9	24.8
10	25.2	2532	24.9	26.1

Table 6- Record of measurement of seed volume of *Tephrosia purpurea*

S. No.	Water required to fill the cylinder (cc)	Volume of 10 seeds (cc)
1	9.80	0.20
2	9.68	0.32
3	9.75	0.25
4	9.65	0.35
5	9.70	0.30
6	9.70	0.30
7	9.75	0.25
8	9.65	0.35
9	9.70	0.30
10	9.75	0.25

Average volume of 10 seeds = 0.28 cc.

Average volume of one seed = 0.028 cc.

Table 7- Record of number of seeds per plant in Tephrosia purpurea

S. No.	No. of seeds produced per plant
1	6225
2	8113
3	4231
4	7300
5	1295
6	7004

7	5330
8	4192
9	1889
10	2486

Reproductive capacity

Reproductive capacity was calculated on the basis of average seed output and the average percentage of seed germination according to formula given below:

$$\text{Reproductive capacity} = \frac{\text{Average seed output}}{100} \times \text{average of seed germination}$$

$$\text{Reproductive capacity} = \frac{4806.5}{100} \times 10$$

So reproductive capacity of *Tephrosia purpurea* was 480.65

DISCUSSIONS

The morphology of its seed was studied by various investigators [13]. In the present study the average volume of the seeds of *Tephrosia purpurea* was of 0.28 cc. and the average weight of the seed is 2.54 mg. The seeds are oblong and very slightly compressed laterally, its end are rounded surface smooth, color is purplish with dark motllings giving variegated appearance.

CONCLUSION

In the present study *Tephrosia purpurea* is selected for ecophysiological and pharmacological studies. It is commonly found in Rewa region of Madhya Pradesh. This natural resources has been much explored by many workers. The plant *Tephrosia purpurea* of the family papilionanceae is rich in medicinal properties. A number of workers have conducted work on *Tephrosia purpurea* and have identified some chemicals and antidisease properties of these chemicals. But the work on Autecology of seed and its germination physiology is very typical.

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