



STUDY OF SEED GERMINATION BEHAVIOUR OF *SOLANUM NIGRUM* L.

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Solanum nigrum L. is a common ruderal growing in a variety of habitats. Two populations of *S.nigrum* viz. Purple Black fruited and Orange Red fruited growing in a field of Patna have been indentified. Seed germination behaviour of the two populations has been investigated. Variation between the two populations has been observed. Fresh seeds of Orange Red fruited population of *S.nigrum* show dormancy . Their dormancy has been investigated by Bano and Ahmad(2007). They germinate naturally after 14 months storage.

Key words : *Solanum nigrum* L., populations, seed germination, variation, forms.

Solanum nigrum L. (SOLANACEAE) is commonly called “Black nightshade” or “gardenshade” in English and Bhatkoi or Makoi in Hindi.It grows in variety of habitats such as weeds in crop fields, along roadside and in waste places. It is an erect, branched, unarmed,annual herb; 15-50cm tall with tap-root stock.Fruits bluish-black,orange-red and purplish-black berries with minute, non-green, discoid seeds. The species grows in shady places and has a long history of medicinal uses.

The present paper deals with the study of seed germination behaviour of two populations of *Solanum nigrum* L. growing in a field of Patliputra colony of Patna. One population of *S.nigrum* L. bears wide, dark green leaves and purplish-black coloured fruits while the other population has a bushy habit with small light green leaves and orange-red coloured fruits. The two populations have been designated by the following codes .

1- Population having wide, ,dark green leaves and purplish black coloured fruits =Sn PB

2-Population having bushy habit, small light green leaves and Orange-red coloured fruits. = Sn OR

Seed germination is a critical event in plant's life cycle. It is an event in which the dormant embryo, becomes metabolically active and forms the young seedling, consequently entering into the most vulnerable phase of the

life cycle.

Many factors regulate the timing of germination. The initial weight of the seeds, the type of food material stored in and degree and kind of dormancy are some internal factors which effect at least the initial stages of development and the competition faced by the seedling within the community in which it grows (Alam,1985).Among the external factors, moisture tensions, light intensities, temperature, photoperiodism and the kind and amount of mineral nutrients available determine the germination behaviour (Lang 1965, Stokes 1965).

Here seed weight, initiation period, rate, percentage and mean percentage germination of both the populations of *Solanum nigrum* L. viz.Sn PB and Sn OR have been studied.

MATERIALS AND METHODS:

100 fresh seeds of Sn PB AND 100 seeds (14 months stored) of Sn OR were weighed in a single pan analytical balance. Thereafter the two lots of seeds were sown separately in earthen pots of moderate size (21 cms in diameter and 18 cms depth) containing common soil. Watering was done daily to keep the soil moist. The seeds with 2mm long radicle showing geotropic curvature were regarded as germinated (Harty and Mc Donald

(1972). Daily reads were taken on the germinating seeds of the two populations viz Sn PB and Sn OR of *Solanum nigrum* L. until rate of germination (in days), percentage and mean flowering and fruiting.

The period between sowing of seed and emergence of radical has been taken as initiation period (in days). The period between sowing of seed and emergence of radical has been taken as initiation period. Rate of germination (in days) and mean percentage germination of the seeds of two populations were recorded.

Rate of germination was calculated by the formula:

$$\beta = \frac{N_n}{t}$$

Where, β = Rate of germination

N_n = Total percentage germination

T = Time period of total percentage germination.

Percentage germination was calculated in the usual way as:

$$\text{Percentage germination} = \frac{\text{Number of seeds sown}}{\text{Number of seeds germinated}} \times 100$$

Thereafter mean of the percentage germination for each population was calculated as

$$\frac{\text{Total percentage germination in a population}}{\text{Total number of plant samples of a population}}$$

Correlation coefficient between the seed weight and percentage seed germination of the two populations was calculated by the Pearson's Product Moment Method. The formula used for this purpose is as follows:

$$r = \frac{\sum xy}{\sqrt{\sum x^2 \times \sum y^2}}$$

Where, x and y represent the deviation of the weight of seeds and percentage seed germination from their actual mean respectively. r denotes the correlation coefficient and one asterisk (*) shows significance and two asterisks (**) show high significance.

RESULTS AND DISCUSSION

Polymorphism in the initiation period, rate and percentage of germination has been recorded for many European and Indian species like *Rumex* (Cavers and Harper 1966), *Spinifex hirsutus* (Harty and Mc Donald 1972), *Euphorbia hirta* (Alam 1985) *Solanum nigrum* L. (Bano 2002). Salisbury (1942) has determined the mean percentage germination of several species like *Solanum nigrum*, *Silene conica* and *Veronica arvensis* etc.

There is variation in seed weight within and between the strains of the same species. Variation in seed weight in the same species may be a hereditary character (Salisbury 1942). Polymorphic species exhibit genetic variation in seed weight (Thompson 1973). The relative germination potential has been found to vary with weight of seeds (Ramakrishnan, 1960). There is evidence that in some species at least doubling of chromosome number in autopolyploid is accompanied by a parallel increase of the seed weight e.g. in *Solanum lycopersicum* and *Nicotiana glauca* (Salisbury 1942).

The period during which the seeds retain their viability, varies greatly from species to species and even among population of a species. The seeds of certain species remain viable for a short time while in others particularly in many of the legumes from few months to several years (*Mimosa glomerata*-221 years, *Cassia*-199 years, *Becquerel* 1970). Variation in the viability of different populations of species due to dormancy, has been studied in cotton seeds (Abelmajid and Osman 1975).

In the present investigation the two populations of *S. nigrum* L. viz Sn PB and Sn OR differ in their seed weight, seed viability, initiation period, rate, percentage and mean percentage germination.

The viability of the seeds of two populations differ with each other. The seeds of Sn PB germinate when sown in fresh state whereas seeds of Sn OR show 14 months dormancy and

Table 1: Mean weight of seeds and their Correlation Coefficient with Percentage germination.

Populations	Mean weight of seeds(100) in mg		Percentage germination		Correlation Coefficient (r-value)
	Fresh seed	14 months Stored seeds	Fresh seed	14month Stored seeds	
Sn PB	100	70	48	0	.57*
Sn OR	140	100	0	20	0.95**

*Significant at 5% level. ** Significant at 1% level.

Table 2: Initiation Period, Rate, Percentage and Mean Percentage germination of *Solanum nigrum* L. Populations.

Population	Initiation Period (in days),Rate of germination (in days),Percentage germination & Mean Percentage germination of seeds.	
	Fresh Seeds	14 months Stored Seeds
Sn PB	6	0
	3.69	0
	.48	0
	1.92	0
Sn OR	0	5
	0	1.53
	0	20
	0	0.8

they germinate after 14 months of storage. The mean weight of 100 fresh seeds and 14 months stored seed of Sn PB is 100 mg & 70 mg respectively, whereas the mean weight of 100 fresh seeds and 14 months stored seeds of Sn OR is 140mg and 100mg respectively. 14 months stored seeds of Sn PB do not germinate. Fresh seeds of Sn OR also do not germinate and thus exhibit dormancy (Table 1). The mode of seed germination of both the populations of *S. nigrum* L. is epigeal. The correlation coefficient (r-value) of seed weight and percentage germination of Sn OR is higher (0.95) than that of Sn PB (0.57) (Table- 1) The initiation period of germination of fresh

seeds of Sn PB is 6 days whereas that of 14 months stored seeds of Sn OR is 5 days. The 14 months stored seeds of Sn OR germinate earlier than that of fresh seeds of (Table-2). Rate, percentage and mean percentage germination of fresh seeds of SnPB is Higher than that of 14 months stored seeds of Sn OR (Table-2). This may be due to storage of Sn OR seeds. The rate, percentage and mean percentage germination of fresh seeds of Sn PB are 3.69,48% and 1.92 respectively. The fresh seeds of Sn OR do not germinate due to dormancy . The rate , percentage and mean percentage germination of 14 months old seed of Sn OR are 1.53,20% and 0.88 respectively.

The naturally occurring populations of *Solanum nigrum* L. have been classified on the basis of fruit colour into 3 morphologically distinguishable forms (Kumar and Pushpangadan 2005). These three forms also bear differences in their chromosome numbers. The three forms are :

1- Purplish Black fruited (n=36) Hexaploid

2- Orange Red fruited (n=24) Tetraploid

3- Shiny Bluish Black fruited (n=12) Diploid.

In the present study we have identified two population forms of *Solanum nigrum* L. and have distinguished them on the basis of their morphological and seed germination behaviour. The two populations are :

1- SnPB (Purple Black fruited)

2- Sn OR (Orange red fruited)

These two populations differ in their seed germination behaviour (Table-1, Table-2). They grow in the same habitat but vary in their seed germination behaviour. This may be due to the in-built genetical mechanism lying within them.

The dormancy in the fresh seeds of Sn OR has been studied by Bano and Ahmad(2007). They have been successful in breaking the dormancy of fresh seeds of Sn OR by treatment of red light.

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