

## EFFECT OF DESICCATION TREATMENT ON CATALASE ACTIVITY OF *SESAMUM INDICUM* L. DURING GERMINATION

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### ABSTRACT

Seedlings of *Sesamum indicum* L. were subjected to desiccation treatment. Catalase activity progressively increased with advance in seedling growth. During desiccation period the enzymic activity decreased while after revival it increased considerably.

### INTRODUCTION

CATALASE activity increases during water stress. Oxidation reduction processes occur at faster rates in plants under water stress which is apparently due to an increase in the metabolism but to an unproductive utilization of energy in vital processes<sup>1,2</sup>.

The effect of different periods of desiccation on the enzymic activity of sesamum seedlings is reported here.

### MATERIAL AND METHODS

Graded seeds of *Sesamum indicum* L. var. Kundla were germinated in Petridishes lined with sterilized filter-paper, and the following growth stages of the seedlings were noted.

Stage	Character
I	Root just emerging
II	Root hairs appear in bunch
III	Hypocotyl just protruding
IV	Hypocotyl developing greenish tinge
V	Testa breaking and cotyledons coming out.

The seeds were germinated upto these five growth stages and subjected to two desiccation treatments of 2 and 4 days respectively.

Method of desiccation treatment has been described elsewhere<sup>3</sup>.

Catalase activity was studied in seedlings upto the fifth growth stage. The estimations were carried out (i) before the initiation of the desiccation treatment, i.e., in the undesiccated material, (ii) at the end of the desiccation period, and (iii) after revival, i.e., when the desiccated seedling had reached the next stage of germination to the one at which it was subjected to desiccated treatment. The data were subjected to analysis of variance using Fisher's method (1954)<sup>4</sup>.

Catalase activity was determined by the method of Chance and Maehly (1955)<sup>5</sup> and expressed as O<sub>2</sub> evolved/min/g. dry wt.

### RESULTS

Considering the complex nature of the experiment the results are grouped to bring out the effects of single factors and also of their interactions. Thus, for instance, to obtain the mean values for different germination stages (I → V), all the determinations for the five desiccation treatments and for the three replicates were added up for each germination stage and divided by the total number of determinations, i.e., (5 × 3) = 15 for each germination stage. Therefore, in Fig. 1, each of the five histograms for

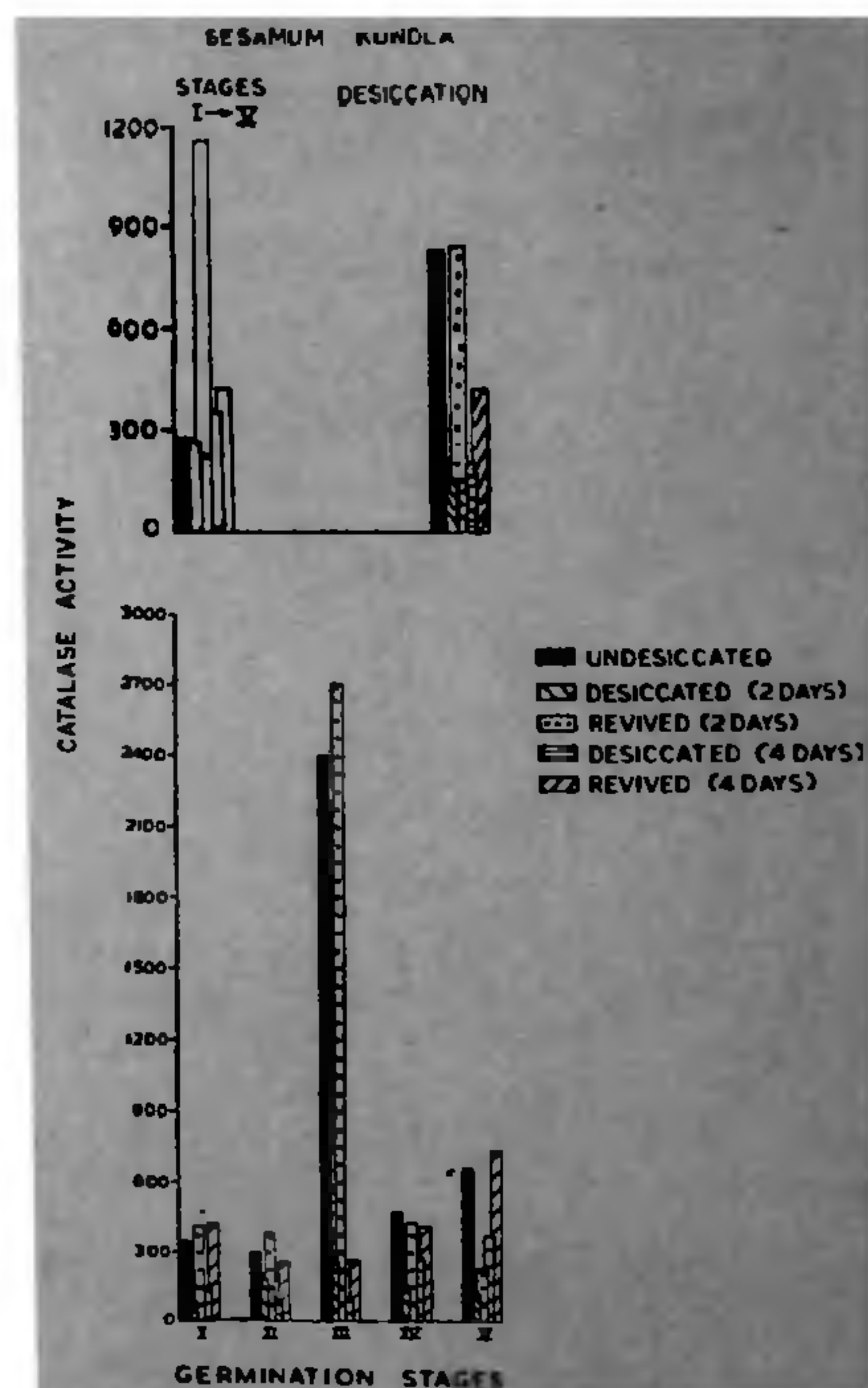


FIG. 1. Catalase activity in *Sesamum indicum* L. var. kundla.

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germination stages is a mean of 15 determinations of catalase activity. Similarly, for the five desiccation treatments, values for the germination stages and for the three replicates were added up for each desiccation treatment and divided by the total number of determinations, i.e.,  $(5 \times 3) = 15$  which gave the mean values for each of the five desiccation treatments.

The following main points emerge from the data :

- (a) There is a progressive increase in the catalase activity with the advance in seedling growth, reaching the maximum value in the third stage.
- (b) During the two desiccation treatments there is a sharp fall in catalase activity which is considerably enhanced in the revived seedlings.
- (c) Seedlings revived after 2-day desiccation treatment register higher catalase activity than the undesiccated seedlings upto the third stage of germination. In both cases the highest value is reached in the third stage. In the later stages, 4-day desiccation treatment and its revival appear more beneficial for catalase activity as compared to 2-day desiccation treatment and its revival.

Analysis of variance of the data (Table I) shows that effects of desiccation treatments are highly significant.

TABLE I

Analysis of variance of data of catalase activity in *Sesamum indicum*, var. kundla

Factor	Degree of freedom	Variance	F value
Stages (St)	4	544321.9	2.0
Desiccation treatment (Dt)	4	2200879.6	8.5*
Replicates	2	78.6	0.0
St × Dt	16	283312.9	1.1
Error	49	256966.9	..
Total	75	..	..

\* Denotes significant effects of treatments at 1% P.

#### DISCUSSION

Increased catalase activity during germination indicates that the catabolic processes are dominant and the resulting breakdown products

function as precursors for the biosynthesis of different metabolites and thus fulfill the energy requirement of the growing seedling.

Increased catalase activity indicates an enhancement in the oxidative activities which is suggestive of the shift in the redox balance of the system to the oxidative side. Thus the increase in the general metabolism of the desiccated seedling caused by the oxidative shift of the redox balance is at the expense of the breakdown products of essential metabolites and the energy liberation being unproductive<sup>2</sup>. As the catabolic processes surpass the anabolic processes, the growth of the seedling becomes standstill. This is evident from the fact that during desiccation period no further growth of the seedling is observed, i.e., during 2 or 4 days of desiccation the seedling remains at the same stage at which it was desiccated.

Jaikaria (1971)<sup>6</sup> observed that in *Cicer* seedlings, the enhanced catalase activity parallels with the greater utilization of ascorbic acid during desiccation, suggesting that the faster production of H<sub>2</sub>O<sub>2</sub> during faster ascorbic acid utilization is used as a substrate by increased catalase and peroxidase activities, thereby affording protection to the plant against peroxidative damages.

These observations indicate that desiccation treatment of suitable period increases the metabolism of the germinating seedlings, thus helping the plant to successfully tide over the unfavourable conditions of water stress.

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