

## Short Communication

# Effects of Light on the Germination of *Isatis demiriziana* Misirdali and *Isatis constricta* Davis's Seeds

S. YUCEL, H.H. INCE<sup>1</sup>, H. MISIRDALI AND Y. KARA<sup>†</sup>

Department of Biology Education, Ziya Gökalp Education Faculty, Dicle University, Diyarbakir, Turkey

<sup>†</sup>Department of Biology, Art & Science Faculty, Pamukkale University, Denizli, Turkey

<sup>1</sup>Corresponding author's e-mail: hhakan@mail.koc.net

## ABSTRACT

The effect of light on the germination of *Isatis demiriziana* and *I.constricta*'s seeds was studied. Among the three environments, the seeds of both the species showed maximum germination in the darkness. However, the germination of *I. constricta* was complete in eight days but in 19 days in *I. demiriziana*.

**Key Words:** *Isatis demiriziana* Misirdali; *Isatis constricta* Davis; Germination; Light effect

## INTRODUCTION

Increasing population growth and urbanization have destroyed biological variety gradually. It is imperative to determine ecological properties of natural taxons to obtain biological abundance constantly using various approaches. Of these the principal approach is seeds germination capability. Germination is influenced by various factors; absorption of water being the basic one for the physiological reactions to occur in the seed (Uygun *et al.*, 1985). In particular oxygen, amount of carbon dioxide, pH and temperature are effective in germination (Zebian *et al.*, 1998). Light factor affects either germination or plant's contents (Haeykuo *et al.*, 2003). Some seeds can germinate in darkness and others can do so both in darkness and in the light (Ahmed, 1970; Öztürk, 1975; Seçmen, 1973). It has been reported that seed germination in *Digitalis ferruginea* L. ssp. *ferruginea* is delayed and minimum in darkness (Yücel *et al.*, 1994). Many systematic and morphological studies were carried out on *Isatis* species in Turkey (Boissier, 1867; Davis, 1964, 1965, 1988; Genç, 1977; Misirdali, 1985; Misirdali *et al.*, 1995; Yildirimli, 1986).

In this research, the role of light on the germination capability of *Isatis demiriziana* and *I.constricta*, endemic to Turkey, was studied.

## MATERIALS AND METHODS

The seeds of *I.demiriziana* and *I.constricta* were collected from Diyarbakir Zulkuf Prophet mountain and its surroundig in June 2002. These seeds were deposited at the Herbarium of Ziya Gökalp Education Faculty of Dicle University. Three different chambers were prepared for the germination experiment of the seeds. The amount of light was selected as variable factor in the chambers. The value of carbon dioxide, temperature and pH were kept constant. The amount of light was determined as 2500 lux in the first room (light), 500 lux in the second room (semilight) and completely dark in the third room

(darkness). Of *I. demiriziana* seeds 620 were put into petry plates covered with filter paper for germination in the three rooms. Of *I.costricta*'s seeds 598 were taken for germination into the same rooms and the filter paper in petry plates were moistured by water every day. This experiment was continued for 19 days.

## RESULTS AND DISCUSSION

Germination started on the second day and was completed in the end of 8<sup>th</sup> day in *I. constricta*. On the second day the germination rate was determined as 12.12% in light, in semilight as 21.72% and 44.06% in darkness (Table I; Fig. 1). The maximum germination rate in the light was found in 5<sup>th</sup> day, in semilight it was determined on the 3<sup>rd</sup> day and on the 2<sup>nd</sup> day in darkness. At the end of 8<sup>th</sup> day,

**Table I. Germination ratio of *Isatis constricta***

	Germination ratio of <i>Isatis constricta</i>						
	2 <sup>nd</sup> day	3 <sup>rd</sup> day	5 <sup>th</sup> day	6 <sup>th</sup> day	8 <sup>th</sup> day	9 <sup>th</sup> day	10 <sup>th</sup> day
Light	12,12	29,80	62,12	66,67	71,21	71,21	71,21
Semilight	21,72	48,99	74,75	76,26	78,28	78,28	78,28
Dark	44,06	83,66	89,60	93,07	96,53	96,53	96,53

**Fig. 1. *Isatis constricta*'s germination**

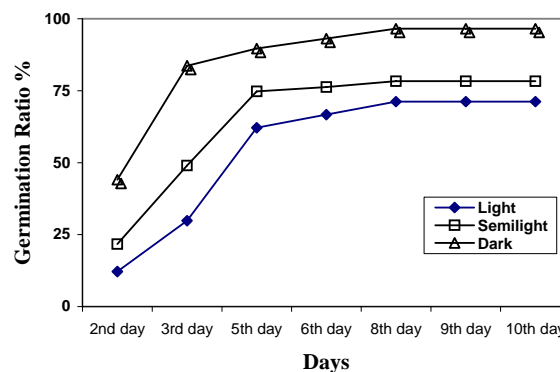
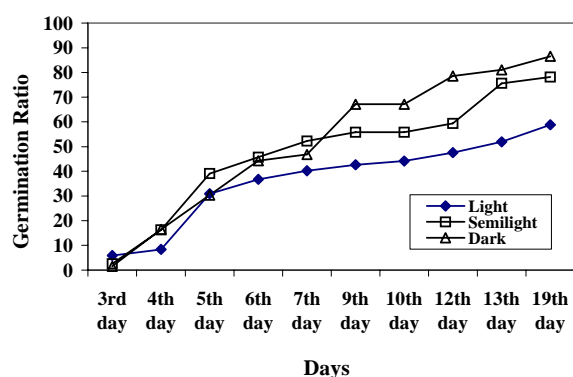
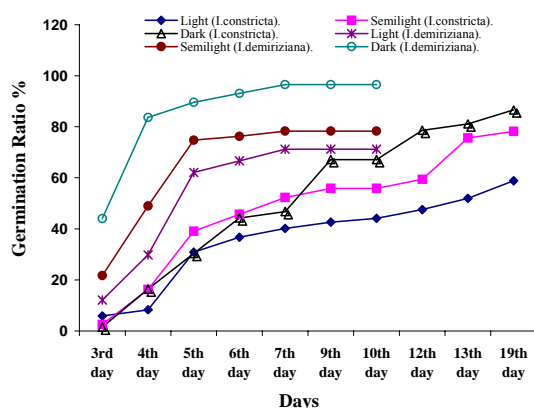


Table II. Germination ratio of *Isatis demiriziana*

	Germination ratio of <i>Isatis demiriziana</i>									
	3 <sup>rd</sup> day	4 <sup>th</sup> day	5 <sup>th</sup> day	6 <sup>th</sup> day	7 <sup>th</sup> day	9 <sup>th</sup> day	10 <sup>th</sup> day	12 <sup>th</sup> day	13 <sup>th</sup> day	19 <sup>th</sup> day
Light	5,88	8,33	30,88	36,76	40,20	42,65	44,12	47,55	51,96	58,82
Semilight	2,54	16,24	39,09	45,69	52,28	55,84	55,84	59,39	75,63	78,17
Dark	1,49	16,42	30,35	44,28	46,77	67,16	67,16	78,61	81,09	86,57

Table III. Comparison of germination rates of *Isatis* species

	3 <sup>rd</sup> day	4 <sup>th</sup> day	5 <sup>th</sup> day	6 <sup>th</sup> day	7 <sup>th</sup> day	9 <sup>th</sup> day	10 <sup>th</sup> day	12 <sup>th</sup> day	13 <sup>th</sup> day	19 <sup>th</sup> day
Light ( <i>I. constricta</i> ).	5,88	8,33	30,88	36,76	40,20	42,65	44,12	47,55	51,96	58,82
Semilight ( <i>I. constricta</i> ).	2,54	16,24	39,09	45,69	52,28	55,84	55,84	59,39	75,63	78,17
Dark ( <i>I. constricta</i> ).	1,49	16,42	30,35	44,28	46,77	67,16	67,16	78,61	81,09	86,57
Light ( <i>I. demiriziana</i> ).	12,12	29,80	62,12	66,67	71,21	71,21	71,21			
Semilight ( <i>I. demiriziana</i> ).	21,72	48,99	74,75	76,26	78,28	78,28	78,28			
Dark ( <i>I. demiriziana</i> ).	44,06	83,66	89,60	93,07	96,53	96,53	96,53			

Fig. 2. *Isatis demiriziana*'s germinationFig. 3. Germination of *Isatis* species

the rate of germination in light was 71%, in semilight 78% and 96% in darkness.

Germination started from the 3<sup>rd</sup> day and was completed in the 19<sup>th</sup> day on *I. demiriziana*. The germination rate was found as 5.88% in light, 2.54% in semilight and 1.49% in darkness. The maximum germination rate in light and semilight environments were

noted in the 5<sup>th</sup> day, but in darkness on 9<sup>th</sup> day. The germination was noted as 58% in light, 78% in semilight and as for 86% in darkness at the end of 19<sup>th</sup> day (Table II; Fig. 2). Seeds of both *Isatis* species germinated maximally in darkness. Although these results show that the light factor effects the germination adversely, it is not an obstructive factor for germination. The seeds of both species put in the same condition complete their germination at different period of the time. In the same way the germination ratio in *I. constricta* was much more than *I. demiriziana*.

## REFERENCES

- Boissier, E., 1867. *Flora Orientalis*, I. Geneve et Basel.
- Davis, P.H., 1964. *Materials For A Flora of Turkey*: VII. Cruciferae, 1: *Isatis*. *Not.Roy.Bot.Gard.Edinb.*, 26: 11–25
- Davis, P.H., 1965–1988. *Flora of Turkey and The East Aegean Islands*. Vol.: 287–307; Vol. 10: 32 and 234. Edinburgh
- Genç, N., 1977. Recherches Morphologiques, Anatomiques et Cytologiques sur *Isatis arenaria* Azn. *Endemite D'environ D'Istanbul. Ist.Univ. Science Fac.*, 42: 113–42
- Misirdali, H., 1985. Morphological and Anatomical Studies on *Isatis* Species of East, South East and the East Mediterranean Region of Turkey. *TUBITAK Main Science Research Group's Project*, TBAG–535. Eskişehir
- Misirdali, H., A. Ocak, N. Orcan, and C. Türe, 1995. *Studies on the Morphology and Anatomy of Isatis mardinensis Misirdali*. Plant Life in South East and Central Asia. *Ege Univ.Press*. İzmir
- Öztürk Ahmed, M., 1970. Ecology of *Ranunculus laetus*, *Phyton. Austria*. 14: 1–8
- Öztürk, M., 1975. Studies on the germination of *Myrtus communis* seeds. *XII. International Botanical Congress*. Leningrad. USSR. 564.
- Seçmen, Ö., 1973. Ecology of *Cerantonia siliqua* L., II. Germination. *Ege Univ. Science Faculty Science Report*. No: 149. İzmir
- Yu-Haey K., R. Pascale, F. Lambein, J. Frias, and C. Vidal-Valverde, 2003. Effects of different germination conditions on the contents of free protein and non-protein amino acids of commercial legumes. *Food chemistry*. Article in press
- Uygunlar, S., M. Yazgan, M. Öztürk, 1985. Water effect on germination of seed (Turkish). *Doğa Sci. J.*, 9: 621–30
- Zebian, K.J., E.G. Reekie, 1998. The interactive a-effects of atmospheric carbon dioxide and light on stem elongation in seedlings of four species. *Annals of Botany*, 81: 185–93

(Received 10 January 2004 ; Accepted 10 September 2004)