IConPB 2025
4th International Congress on Plant Biology
September 03-06, 2025, Denizli -Türkiye

Determination of the Spore Production Capacity of *Timmiella anomala* (Timmiellaceae/Bryophyta)

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INTRODUCTION

Bryophytes are plants that play important ecological roles in different ecosystems, adapting to different environmental factors. These early land plants serve as model organisms for understanding the evolutionary adaptation of taxa to life on land. For this reason, there are many international studies on the subject.(Melvin J. Oliver, Jeff Velten & Andrew J. Wood 2000; Armin Horn et al. 2021). In our country, the interest in bryophytes started quite late and the prioritization of floristic studies has caused insufficient studies on similar subjects. This study was planned to close this gap to some extent. *Timmiella anomala* (Bruch & Schimp.) Limpr. was selected as the research material. This taxon is a successful taxon with a wide distribution in Western Anatolia. The taxon prefers vegetative and generative reproduction models in different environments, and the reason why it adopts these behaviors was tried to be understood by the number of sporophytes produced and the number of spores contained in these sporophytes.

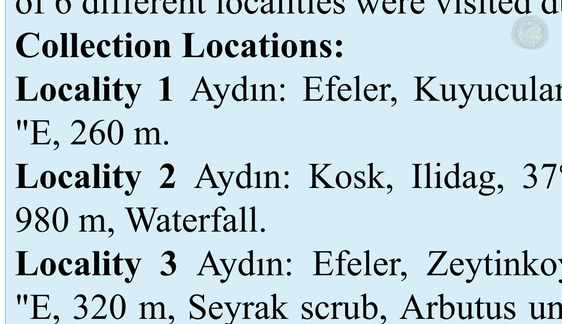
MATERIALS AND METHODS

Research material: *Timmiella anomala*
Divisio: BRYOPHYTA
Ordo : Pottiales
Fam : Timmiellaceae
Genus: Timmiella
Capsule cylindrical, straight or slightly oblique, 3-5 mm long, anulus present; seta straight, peristome teeth spiral, operculum conical, calyptra 3-3.5 mm long, spores 8-12 µm in diameter; usually grows on calcareous soil and rocks. Field studies: A total of 6 different localities were visited during the field studies:

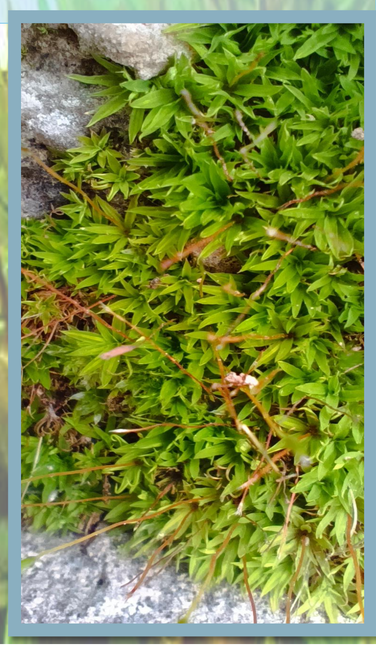
Collection Locations:

Locality 1 Aydın: Efeler, Kuyucular, 37°51'24.0 "N 28°00'06.0 "E, 260 m.
Locality 2 Aydın: Kosk, Ilidag, 37°57'24.0 "N 28°02'30.0 "E, 980 m, Waterfall.
Locality 3 Aydın: Efeler, Zeytinkoy, 37°54'23.1 "N27°51'23.7 "E, 320 m, Seyrak scrub, Arbutus unedo, Olea europaea, Myrtus sp.
Locality 4 Aydın: Efeler, Zeytinkoy, 37°55'12.5 "N 27°52'03.8 "E, 530 m, Laurus nobilis, Platanus orientalis, Pictacia sp., Quercus sp.
Locality 5 Aydın: Efeler, Egrikavak, 37°57'32.8 "N 27°57'50.3 "E, 1000 m, Pinus brutia, limestone rock.
Locality 6 Imamkoy, 37°51'38.0 "N 27°54'40.0 "E, 104 m, Olea europaea.

The number of gametophytes and total number of sporophytes were determined in plants collected from 10x10 cm areas from these localities. Five healthy closed sporophytes were selected from each locality, spores were evacuated, spread on a slide and photographed to determine the number of spores. These photographs were counted with the 'Image J' program. The data were transferred to the table.







RESULTS

Timmilella anomala	Number of individuals without sporophyte	Number of open sporophytes	Number of indoor sporophytes	Number of spore
Locality 1	1702	64	126	233.081
Locality 2	742	249	206	175.300
Locality 2	5392	165	168	193.262
Locality 2	8040	-	-	-
Locality 3	562	7	15	3.144
Locality 4	276	-	-	-
Locality 5	749	-	-	-
Locality 6	1100	137	256	149.008
Locality 6	951	-	-	-

DISCUSSION and CONCLUSION

The findings revealed that the spore production capacity of *Timmiella anomala* varies depending on habitat conditions. Sporophyte production was high in humid and shady localities and low in urban and sunny areas. It is thought that environmental stress suppresses sexual reproduction in habitats with sporophyte-free individuals. The maturation process of the capsules varies in the same period. This suggests that microclimatic conditions are determinant on sporophyte development. In agreement with similar studies in the literature, this study revealed that the reproductive success of T. anomala is sensitive to environmental factors and that spore production may play a role in habitat preference. The spore production capacity of *Timmiella anomala* is directly affected by habitat conditions. Sporophyte production is costly and is more common in more unstable environments. This is important for the plant's survival against unfavorable conditions. It was observed that the number of sporophytes decreased with the stabilization of the habitat. A similar pattern was also observed in the number of spores contained within the sporophytes. The variation in sporophyte production of the species reflects its ecological adaptation and dispersal potential. These findings are important for understanding the reproductive responses of bryophytes to environmental stresses and for developing conservation strategies.





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