

PRELIMINARY OBSERVATIONS ON VISITOR SPECTRUM OF *RHODODENDRON ARBOREUM* IN THE KUMAON HIMALAYA, INDIA

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Introduction

Rhododendron arboreum Smith (Ericaceae) is the state flower of Uttarakhand. It is of economic importance because of the edible petals, which are used for squashes and jam as well as for the wood, which is used for fuel. It grows from 1500 to 3600 m elevation and flowers between January and May, depending upon the elevation, soil, slope direction and weather (Polunin & Stainton, 1984). Despite the long flowering season, it is amongst the earliest flowers in the Himalaya along with *Daphne* Linnaeus sp. and *Reinwardtia trigyna* Planch.

The flowers have numerous diurnal visitors, including birds and insects. So far, there is no published information on the pollinator spectrum or the visitor spectrum of *Rhododendron arboreum* in the Kumaon Himalaya.

Methodology

Suitable flowering trees were located and visitors to the flowers were observed and photographed. For identification of insects to genus level, specimens were collected and curated. Observations were undertaken at three locations in the Gagar range of Nainital district, Uttarakhand. The first location was at Maheshkhan Reserve Forest (1900 m) in a mixed broadleaf forest dominated by Himalayan silver oak *Quercus*

leucotrichophora A. Camus, the second location was four kilometres ahead of Dhari at ca. 1700 m, where some *Rhododendron* trees were flowering in the Chir Pine forest (*Pinus roxburghii* Sarg.). The third location was one kilometre ahead of Dhanachuli Bend at 2000 m elevation in a mixed broadleaf forest similar to the forest at the first site. Observations were undertaken between 10 am and 3 pm, after which insect activity stopped. Specimens were collected from the Dhanachuli Bend site and curated and deposited at the Butterfly Research Centre, Bhimtal.

Observations

We visited Maheshkhan Reserve Forest on 1.iii.2020 from 10 am to 2 pm, after which the sky got overcast and we were forced to return. On 3.iii.2020 and 22.iii.2020, sites in Dhari and Dhanachuli Bend were visited. In between the two dates, the weather was inclement with rain, hail and snow. Dhari site was entirely unproductive while the Dhanachuli Bend site had numerous visitors. Flowering trees grew on different aspects of the hills and received sunlight at different times, depending upon the direction of the slope. It was found that insects did not visit flowering trees in the shade but waited until the tree was sunlit before visiting it in numbers. Birds were also seen to prefer sunlit trees rather than trees in the shade.

Remarks

Rhododendron arboreum flowers at different times at different elevation. It flowers as early as January or February in some years at the lower part of its altitudinal distribution and as late as mid - May towards the upper end of its distribution. Chand (2017) reported 9 species of birds and a bumble bee (*Bombus* sp.) as visitors of *R. arboreum* flowers in the Garhwal Himalaya. Ollerton *et al.* (2019) reported 8 species of birds visiting these flowers in Nepal.

Not all flowering trees of this species in an area attract bird or insect visitors. Young flowering trees attract fewer visitors than mature flowering trees.

The trees examined in Chir Pine forest had no flower visitors while trees in broadleaf forest attracted a wide spectrum of visitors at the Maheshkhan R.F. and at the Dhanachuli Bend sites. On the 22.iii.2020 there were no butterflies whatsoever on the wing. On 1.iii.2020, in addition to butterflies that visited *R. arboreum* flowers, the following species were on the wing: Indian Cabbage White *Pieris canidia* (Linnaeus, 1768); Spotless Grass Yellow *Eurema laeta* (Boisduval, 1836); Dark Himalayan Oakblue *Arhopala rama* (Kollar, [1844]) and Common Punch *Dodona durga* (Kollar, [1844]). On 1.iii.2020, an overwintering species, the Blue Admiral *Kaniska canace* (Linnaeus, 1763) was active. There were many more flies active on 22.iii.2020 than on 3.iii.2020 at the Dhanachuli Bend site while there were no *Apis* L. species active on 22.iii.2020 at the Dhanachuli Bend site.

Conclusion**Flower visitors of *Rhododendron arboreum***

Class	Family	Species	Location
Insecta	Nymphalidae	Blue Admiral <i>Kaniska canace</i>	Maheshkhan

It was found that a variety of birds and insects visit flowers of *R. arboreum* for nectar. *R. arboreum* is gregarious and probably constitutes an important food resource at a lean time of the year. The lack of flower visitors in Chir Pine forest at Dhari is probably due to the lack of insect populations in the area, which experiences forest fires regularly. The visitor and pollinator spectrum of *R. arboreum* flowers in the Kumaon Himalaya is still unclear and will require nocturnal observations in addition to daytime observations.

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Insecta	Nymphalidae	Chocolate Pansy <i>Junonia iphita</i> (Cramer, [1779])	Maheshkhan
Insecta	Calliphoridae	Bluebottles	Maheshkhan, Dhanachuli Bend
Insecta	Syrphidae	Hoverflies	Maheshkhan, Dhanachuli Bend
Insecta	Apidae	Eastern Honeybee <i>Apis cerana</i> Fabricius, 1793	Maheshkhan, Dhanachuli Bend
Aves	Pycnonotidae	Mountain Bulbul <i>Ixos mcclllandii</i> , Horsfield, 1840	Dhanachuli Bend
Aves	Pycnonotidae	Black Bulbul <i>Hypsipetes leucocephalus</i> (Gmelin, 1789)	Maheshkhan
Aves	Sittidae	Chestnut bellied Nuthatch <i>Sitta (castanea) cinnamoventris</i> Blyth, 1842	Dhanachuli Bend, a single female