ISSN: 2457-0761

JBC-APRF-4(1): 293-293, 2020

JOURNAL OF BIODIVERSITY AND CONSERVATION

Phytochemistry of Food Plants of *Columba punicea* Tickell 1842

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ARTICLE INFO

Article History
Received: 10 November 2019
Received in revised form: 10 February 2020
Accepted: 18 March 2020

Keywords: Bioactive compounds, Conservation, Food plants

ABSTRACT

Pale-capped pigeon (*Columba punicea*) is a bird of family Columbidae comes under threatened category of birds in Odisha. Due to urbanization and deforestation, their population has declined from the last few decades. Keeping this in view, an attempt has been done to analyse the presence of secondary metabolites in their preferred food; fruits of *Trema orientalis*. The result revealed that they mostly consumed them before breeding. The phytochemical analysis showed the presence of terpenoids & other compounds, might be helpful to maintain their breeding behaviors. The present study highlights the phytochemistry of fruiting plants to establish the bird-plant relationship and will provide a base line data for making their conservation plan.

INTRODUCTION

Pale Capped Pigeon (*Columba punicea*) also known as Purple Wood Pigeon belongs to family Columbidae. It is a large 36-40.5 cm long pigeon, chestnut brown with contrasting pale crown. The male has whitish- grey crown, purplish-marron upperparts with faint green gloss on the neck. Females have more brownish-greyer crown. Juveniles initially have crown colour matching the mantle, duller wings-coverts and scapulars with rufous fringes, a much-reduced gloss on the upperparts and greyer underparts. The skin around the eyes and ceres are magenta (Blanford 1898; Baker 1913; Ali and Ripley 1981). Pale capped pigeon (*Columba punicea*) species are distributed in India, Bangladesh, Southeast Asian countries. The current population of the pale-capped pigeon species is estimated to be less than 10,000 birds and its under decline (BI 2012). The pigeon species are listed as 'Vulnerable' to extinction by IUCN (2012). In India, these pale-capped pigeons occur in states of Maharashtra, Bihar, Andhra Pradesh, Odisha (Jayakar 1967;

Mooney 1934). The diet of these birds is mostly fruits, bamboo seeds and grains. The pale-capped pigeon has approached the thresholds for being Vulnerable, under the range size criterion, loss of habitat and hunting pressure are the main threats that enlarger the survival of these pigeon species. The diet of these pale capped pigeon is mostly fruits. They feed on fruits, leaves and seeds of *T. orientalis* (Plate 1.1). These birds forage in the morning and evening and rest in the heat of the day. The breeding season of these pale capped pigeon is from May to August. Peak breeding takes place in July. Before its breeding period they feed on *T. orientalis.* It was observed feeding on this plant mostly during December (Kumar and Mohanty 2016). *T. orientalis* is a species of flowering tree in the hemp family, Ulmaceae. It is known by many common names including charcoal tree, Indian Nettle, Pigeon wood and Gunpowder tree. It is a fast-growing shade tree with soft foliage. It is a straight slender tree up to 18 metres in height and sometimes grow as a shrub approximately 3 metres tall. It is found in tropical and warm temperate parts of the world, with a range extending from South Africa, through Middle East, the Indian Sub-continental and Southern China to Southeast Asia and Australia. The tree has various uses as herbal medicine in a wide range of culture. The leaves and bark are used to treat cough, sore throat, asthma, bronchitis, gonorrhoea, yellow fever and as an antidote to general poisoning (Eckman et al. 1993; Orwa et al. 2009). A bark infusion is reportedly drunk to control dysentery and a leaf decoction is used to deworm dogs (Orwa et al. 2009). In recent pharmacological studies an aqueous extract from bark has been shown to reduce diabetes mellitus, and may be useful for treating the disease (Kamtchouing et al. 2006). Several species of birds that is the pigeon and doves are often found in these trees where they eat the fruits or make their nests. The leaves, pods and seeds are used as fodder for cattle buffalos and goats (Orwa et al. 2009). It is a pioneer species that can grow on poor soil and can be used to regenerate forest areas by providing shade and protection. *T. orientalis* is nitrogen fixing plant and thereby improve soil fertility for other plant species (Eckman et al. 1993). The bioactive compounds such as tannins, saponins, phenols, flavonoids, volatile oils, terpenoids, glycosides, steroids and alkaloids were found to be present (Gabriel et al. 2016). Due to presence of these bioactive compounds it encourages these mutualistic frugivores birds to consume their fruit which might control their breeding behavior and in return these birds help in seed dispersion of the plant species. Keeping all mention word, a experiment was designed to study the phytochemistry of *T. orientalis* and establish the relation between Pale capped pigeon and *T. orientalis*.

MATERIALS AND METHODOLOGY

1. *Selection, identification and enumeration of selected experimental plant for the aim of the work*

The experimental plant (*T. orientalis*) was collected (Plate 1.2) from urban areas of Bhubaneswar, Odisha. The selection is based on interaction between plant and bird species. The selected species was characterized using morphology characteristic (Kumar et al. 2018).

2. *Collection of experimental plant species*

The sample was collected and kept in the polythene bag tagged with botanical name and sorted as per standard sampling procedure. The experimental plant species was properly washed and dried for further work.

3. Preparation of plant extracts

The experimental plant was collected and dried at room temperature and was powdered after grind using mechanical devices. The extraction (Plate 1.3) was done using different solvents as per polarity index through the Soxhlet extraction method (Kumar et al. 2018).

4. Phytochemical screening

Three solvents (aqueous, acetone, chloroform) as per their polarity index were used for phytochemical screening to check the presence of different bioactive compounds such as tannins, saponins, phenolic compounds, flavonoids, terpenoids etc. 1 ml of leaf sample was taken in a tube and 2 ml of solvent was added to leaf sample to check the above bioactive compounds (Kumar et al. 2018).

5. Thin layer chromatography

For thin layer chromatography (TLC) glass plate of TLC silica was used. The plates were washed with water and were dried and swiped with ethyl acetate and left for 10 mins. The slurry of silica and water was poured and the TLC plate kept overnight to dry. The TLC plated was heated for 30 mins at 110-degree Celsius. The samples were applied on the silica get by micropipette and the plates were dipped in different mobile phase having different ratio (Kumar et al. 2018).

RESULTS AND DISCUSSION

Pale-capped pigeon are known to be purple wood pigeon which are mostly found in different regions of Indian subcontinent. They are frugivores and seminomadic and observed roosting in forest dwelling areas, where they were found feeding on *T. orientalis*. It is also known as charcoal tree that have many medicinal properties. The phytochemical test of *T. orientalis* showed the presence of flavonoids, terpenoids and phenolic compounds (Table 1). TLC analysis of methanol extract of leaves and fruit of *T. orientalis* performed on mobile phase. From Thin Layer Chromatography experiment, various spots were detected through naked eye on silica coated activated TLC plate with different mobile phase (Table 2). This result shows that *T. orientalis* have of bioactive compounds which help PCP to regulate the hormonal action.

CONCLUSION

Considering the importance of *T. orientalis* for the conservation of a vulnerable species, Pale capped pigeon, present study was designed to observe why the species consume fruits before breeding periods. The results mentioned above conclude that plantation of *T. orientalis* is need in the habitat areas of Pale capped pigeon. Further advance research is needed to isolate the responsible compounds for triggers the hormones for breeding to understand reproductive biology of the species.

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Authors are thankful to Dr. Sanjeet Kumar, CEO, Ambika Prasad Research Foundation; HOD, Department of Biotechnology, Rama Devi Women's

University, Bhubaneswar and local communities of study areas.

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Table 1: Phytochemical analysis of fruits of *T. orientalis*

Extract	Tannin	Saponin	Phenolic Compounds	Terpenoids	Flavonoids
Aqueous	+	-	+	-	-
Acetone	-	-	-	-	+
Chloroform	-	-	-	+	-
Methanol	+	-	+	-	+

Table 2: Thin Layer Chromatography of methanol extract of *T. orientalis* fruits

Mobile Phase	Ratio	Rf values
C:M	9:1	0.43, 0.3
E:M:W	40:5.4:4	0.32, 0.362
C:E:F	10:8:2	0.312, 0.287

(C: chloroform; E: ethanol; W: water; F: formic acid; M: methanol)

Plate 1: Collection and extraction of experimental plant; 1) *T. orientalis*; 2) Collection of plant parts; 3) Extraction