

## 4.2 = Plants and frugivorous birds in the Botanic Garden of Pisa

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Among close correlations between plants and animals, there is ornithochory, i.e. seed dispersal by birds (1). At least since 1980s, many papers have highlighted the importance of this kind of dispersal in most natural or semi-natural biomes (2, 3, 4, 5), given that fruit pulp is an important nutritional source for many bird species (6, 7).

In this contribution, we report observations on plant-birds interactions, carried out in the Botanic Garden of Pisa from 2017 up to 2019. We have recorded 207 notes related to 18 plant species - mainly trees and shrubs - and to 15 birds species: 89 out of 207 are fruit-eating observations, involving 12 plant species (Table 1) and 7 bird species (Table 2), mainly in autumn and winter. In the Tables we report the number of feeding records, and the number of bird and plant species are respectively reported, in brackets.

The fruits of Persimmon (*Diospyros kaki*) were eaten (Table 1; Fig. 1) by the highest number of bird species: Blackbird, Blackcap, Blue tit, Great tit and Starling. Blackbird and Blackcap are the species showing the broadest dietary spectrum (Table 1), with 10 and 7 out of the 12 plant species, respectively.

Plant species	N°
<i>Diospyros kaki</i> Thunb.	23 (5)
<i>Ilex aquifolium</i> L.	17 (2)
<i>Stranvaesia nussia</i> (Buch.-Ham. ex D. Don) Decne.	11 (2)
<i>Ziziphus jujuba</i> Mill.	10 (3)
<i>Diospyros lotus</i> L.	10 (2)
<i>Hedera helix</i> L.	5 (1)
<i>Morus nigra</i> L.	3 (2)
<i>Euonymus europaeus</i> L.	3 (1)
<i>Ligustrum lucidum</i> W.T. Aiton	3 (2)
<i>Carya illinoensis</i> (Wangenh.) K.Koch	2 (2)
<i>Arbutus unedo</i> L.	1 (1)
<i>Mahonia aquifolium</i> (Pursh) Nutt.	1 (1)
<b>Total</b>	<b>89</b>

Table 1. List of plant species by decreasing number of feeding records; number of bird species in brackets.

Bird species	N°
Blackcap ( <i>Sylvia atricapilla</i> )	39 (7)
Blackbird ( <i>Turdus merula</i> )	37 (10)
Blue tit ( <i>Cyanistes caeruleus</i> )	8 (2)
Great tit ( <i>Parus major</i> )	2 (2)
Starling ( <i>Sturnus vulgaris</i> )	1 (1)
Jackdaw ( <i>Corvus monedula</i> )	1 (1)
Greenfinch ( <i>Carduelis chloris</i> )	1 (1)
<b>Total</b>	<b>89</b>

Table 2. List of bird species by decreasing number of feeding records; number of plant species in brackets.



Fig. 1. A half-eaten fruit of Persimmon, 20<sup>th</sup> November 2017

As regards the colour of fleshy fruits, birds prefer red fruits (3, 8), but black, orange and blue are also attractive. Fruits may provide sugars, lipids, proteins, minerals, water (4, 9) and secondary metabolites, some of these potentially toxic (10, 11, 12).

Results are discussed on the basis of some considerations on the preferences of these birds; further surveys are in progress, encouraged by shortage of information about the Italian bird community.

- 1) B. Snow, D. Snow (2010) Birds and berries, A&C Black
- 2) K. Hruska (1993) Giornale Botanico Italiano, 127(3), 635
- 3) A. Caputa, A. Manzi, K. Hruska (1994) Giornale Botanico Italiano, 128(1), 349
- 4) C. Bello, M. Galetti, D. Montan, M. Pizo, T. Mariguella, L. Culot, F. Bufalo, F. Labecca, F. Pedrosa, R. Constantini, C. Emer, W. Silva, F.R. da Silva, O. Ovaskainen, P. Jordano (2016) Ecology, 98(6), 1729
- 5) A.G. Castro, S. Yang, A.T. Carlo (2019) Functional Ecology, 33(2), 229-238
- 6) H.M. Schaefer, A. Valido, P. Jordano (2014) Proc. R. Soc. B, 281, 2013-2516
- 7) P.G. Blendiger, N.P. Giannini, I. Zampini, R. Ordóñez, S. Torres, J.E. Sayago, R.A. Ruggera, M.I. Isla (2015) Ibis, 157(3), 480-495
- 8) Q. Duan, E. Goodale, R. Quan (2014) Scientific Reports, 4, 5627
- 9) P. Jordano (1988) Ardea, 76, 193-209
- 10) F. Bairlein (1996) Comp. Biochem. Physiol., 113A (3), 215-224
- 11) J.H. Jacobs, S.J. Clark, I. Denholm, D. Goulson, C. Stodate, J.L. Osborne (2010) Arthropod-Plant Interactions, 4, 19-28
- 12) H. Coklar, M. Akbulut (2017) J Functional Foods, 35, 166-174