Original Research

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Journal of Environmental Biology

JEB™

ISSN: 0254-8704 (Print)
ISSN: 2394-0379 (Online)
CODEN: JEBIDP

DOI : http://doi.org/10.22438/jeb/38/4/PRN-110

Role of common raven, *Corvus corax*, in reducing crop pests population in some agricultural areas in Algeria

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Key words

Crop pest,
Corvus corax,
Pest population,
Predation

Publication Info

Paper received : 03.12.2015
Revised received : 04.05.2016
Re-revised received : 11.10.2016
Accepted : 09.11.2016

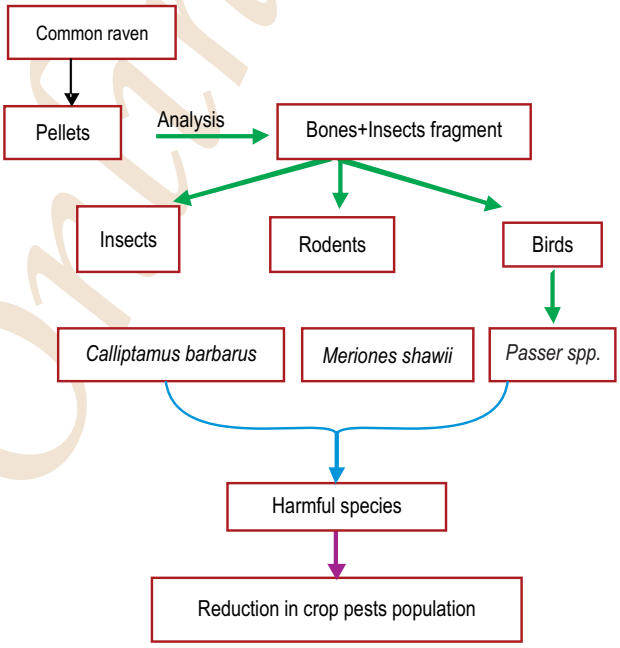
Abstract

Aim: The aim of the present study was to investigate through diet analysis, how common raven contribute to control some crop pests in two regions of Algeria, Djelfa and Laghouat.

Methodology: The diet of Common raven was realized by analysis of one hundred and sixty pellets. Each pellet was dissected in water and gently broken apart, and prey remains were separated manually. Vertebrate prey items were identified from bones. Insects were identified from the main body parts, including heads, mandibles, antennae, legs and especially elytrae.

Results: A total of 224 preys were identified in trophic diet of common raven at Djelfa region and 65 at Laghouat. Among these prey groups, insects were mostly ingested by common raven in both Djelfa (80.3 %) and Laghouat (93.4 %). In terms of biomass, *Meriones shawii* was mostly consumed by ravens (53.5 % in Djelfa and 63.93 % in Laghouat). Also, *Passer* spp. was one of the most profitable to ravens (11.7 % in Djelfa and 3.9 % in Laghouat).

Interpretation: The common raven can participate in rodents and birds population, which pose a great threat to crops in agricultural areas.



Introduction

Birds play a major role in ecology and biodiversity conservation intervening in plant pollination (Agne *et al*., 2014; Provost *et al.,* 2012) in seed dissemination (Charles – Dominique, 2003), as well as having a direct action against pest species for agriculture (Gramet, 1974). In Algeria, predation pest species such as birds (Ploceidae) and mammals (Murinae and Gerbillinae) is highlighted notably studied for raptors (Baziz *et al.,* 2005; Souttou *et al.,* 2007, Sekour *et al.,* 2010, 2014).The same case has been observed in omnivorous birds such as gulls (*Larus michahelli* Naumann, 1840) (Molai *et al.,* 2007). Common ravan *Corvus corax*, L., 1758, is one of the most widespread species in the world (Inac *et al.,* 2008; Arslangundogdu, 2010; Rajashekara and Venkatesha, 2011). Several studies on the diet of this species have been made recently in Algeria (Guerzou *et al.,* 2012, 2013). So, the main objective of the present study was to higlight usefulness of common raven in reducing few pests species population that pose threat to crops in agro-pastoral and sub-Saharan areas in Algeria.

Materials and Methods

The common raven's pellets were collected from at Djelfa region, under the perches below Aleppo pines *Pinus halepensis,* and under power poles where raven's nests were build at Laghouat region. The analysis of 160 regurgitations was made in laboratory. Identification of species was done by references of determination keys for Hymenoptera (Bertrand, 1940), Orhtoptera (Chopard, 1943), Coleoptera (Perrier, 1927, 1932) and Rodentia (Barreau *et al.,* 1991) and by using the reference collection of the Department of Zoology of the Agronomic National High School at El Harrach (Algiers). So, the confirmation of arthropd's identification was made using identification key (Hacini and Doumandji, 1998). The results were analyzed using different ecological indices of composition such as total richeness, which is the number of species found in all the pellets of *Corvus corax*, relative abundance, which is the percent proportion of the individual number of prey species (ni) in relation to overall number of individuals number of all species (N), and percentage of biomass which is the percent proportion of the weight of the individuals of a species (Pi) to the total weight of whole preys (P).

Two regions were selected to carry out the present study, the region of Djelfa (34°11' 34°54' N.; 3°15' 3°46E) which is a part of Algerian steppe and region of Laghoaut (33° 48' N; 2°53' E.) situated at the level of Sahran Atlas (Fig. 1). The region of Djelfa is characterized by low and irregular rainfall (100 to 400 mm per year) and its high mean temperature is higher than 30°C in July. Steppe vegetation is dominated by alfa (*Stipa tennacissima* Linné) and white Artemisia (*Artemisia herba alba* Asso.). On the other hand, Laghouat region spreads on a part of the upstream of Wadi Mzi, which is great temporary watercourse of the Soutern Sahara Atlas. The quarter of the territory constitutes of agricultural land, while rest of the territory constitutes of bare ground, range lands of ancient massifs and alfa cover.

Results and Discussion

A total of 224 preys were identified in trophic diet of common raven at Djelfa region and 65 at Laghouat region. Among these prey groups insects were mostly ingested by common raven in both Djelfa (80.3 %) and Laghouat (93.4 %) regions. (Table 1). These results were higher than other observed in similar habitat in the desert of Mojave California (37 %) (Kristan *et al.,* 2004). It should be recalled that crop and vegetal steppe cover pests on one hand belongs to insects and on the other hand to birds and rodents. Predation upon locusts is notably intense during periodic pullulating of *Calliptamus barbarus* and C. *wattenwylianus*. In western and eastern Zahrez the Moroccan locust (*Dociostaurus maroccanus*) is another potential predator of alfa cover, that irregularly appears one time in four or five years (Pasquier, 1937). In terms of biomass, other pests are present in both the regions. The willow sparrow (*Passer hispaniolensis*) plus its hybrid with house sparrow (P. *domesticus* X P. *hispaniolensis*) are profitable to ravens (B % = 63.9 % in Laghouat and 45.9 % in Djelfa) (Table 1). More than 9 % of these rates correspond to sparrow species. It has been demonstrated that hybrid sparrows provoke yield reduction in wheat and barley fields in high Plateaux than in Mitidja nearshore (Behidj –Benyounes *et al*., 2011). However, Amat et Obesco (1989) in weatlands of Guadalquivir (Spain) mentioned a bird prey reach a small percentage in raven's diet (from 24.5 % in 1987 and 20.3 % in 1988). Concerning passerines, they have the lowest rates (0.6 % and 0.3 % respectively). Since beginning of March, Shaw's jird (*Meriones shawii)* reproduces in steppe regions and sub Saharan. The common raven predate both on juveniles and adults of jirds mainly during spring, so they can participate in reducing rodent' s population in agricultural areas of North Africa (Adamou- Djerbaoui *et al.,* 2013).

In other cases as occur in the West Mojave Desert, mammals such as Carnivora, Lagomorpha and Rodentia

Fig. 1 : Geographic situation of Djelfa and Laghouat area

Table 1 : Values of relative abundance and biomass of prey - species of *Corvus corax* in the two study areas

Classes	species	Djelfa		Laghouat	
		AR%	B%	AR%	B%
Gastropoda		5,62	0,04	-	-
Arachnida		6,06	1,09	1,62	1,39
Insecta		80,25	2,87	93,35	15,07
	Calliptamus sp.	10,69	0,40	-	-
	Calliptamus barbarous	0,57	0,02	-	-
	Messor sp.	0,90	0,01	14,51	0,83
	Messor capitatus	1,68	0,01	8,77	0,36
	Messor structor	0,00	0,00	6,14	0,25
	Messor barbara	0,57	0,00	0,00	0,00
	Messor arenarius	12,78	0,10	33,41	1,94
	Messor medioruber	1,64	0,03	1,82	0,11
Reptilia		3,01	1,79	1,80	4,55
Aves		14,69	91,71	1,14	19,67
	Passeriforme sp. indét.	4,69	7,27	0,91	15,67
	Passer sp.	9,29	11,71	0,23	3,92
Amphibia		0,09	0,23	0,18	1,77
Mammalia		50,04	93,39	3,75	83,74
	Meriones shawii	9,29	53,54	1,33	63,93

constituted the most important prey ingested by ravens (Kristan *et al.,* 2004). They found mammals in 76.5 % of pellets. In South-West Slovenia, ravens food constituted of small mammals such as Muridae and Gliridae (Tome *et al*., 2009). Losses caused by rodents, particularly by Shaw's jird on cultivation and food reserves has been reported (Singleton *et al*., 2003; Graine, 1980). In Morocco, loss of grain was estimated to be 4 q ha^{-1} (Ouzaouit and Id Messaoud, 2000). In Algeria, agricultural areas affected by rodents species were estimated to be 400 ha in 2005 (Adamou- Djerbaoui *et al.,* 2013). Likewise, toxicity imposed by these rodents has been reported in 45 countries worldwide, including Algeria (Kobayashi *et al.,* 2011; Sekour *et al.,* 2010) and elsewhere in other countries, such as Belgium, Brazil and Japan (Kobayashi, 2000; Kobayashi, 2001; Revathi and Yogananda, 2006). In fact, rodents are reservoir of several pathogens including different viruses. Theses pathogens can be transmitted to humans through ticks or mites causing many diseases affecting public health (Meerburg *et al*., 2009). Transmission occurs in different ways, directly by contact or bite, indirectly through piercing by their external parasites or with their feces that contaminate food (Singleton *et al*., 2003).

The selection of preys by common Raven in the Algerian high plateaus is very interesting. Indeed, the diet consists of a large number of pests which pose a great threat to crops.

Acknowledgments

The authors thank the referees for their valuable suggestions.

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