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PRELIMINARY ANALYSIS OF THE DIET OF WILD BOAR IN PAKISTAN

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PRELIMINARY ANALYSIS OF THE DIET OF WILD BOAR IN PAKISTAN

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Abstract: We examined the stomach contents of 393 wild boar (*Sus scrofa*) collected by hunting in the irrigated croplands of central Punjab, Pakistan. Plant materials, both cultivated and non-cultivated, comprised 96.9% of the total mass; animal matter (2.5%) and mud (0.6%) made up the rest. Wheat, both leaves and grains, were the predominant dietary item, with 54.7% of the mass, and occurring in 262 stomachs. Wheat dominated the collections. Sugarcane (8.6% and in 64 stomachs), rice (3.6% and 20 stomachs), mesquite, *Prosopis juliflora*, (7.2% and 43 stomachs) were the other predominant items. Wheat first appeared as leaves in December samples; leaves predominated through March, when wheat grains became the major item. This continued through July. Rice first appeared in August, peaked in October and was finished by December. Sugarcane was important in December through March. Mesquite was heavily utilized in June and July, following wheat harvest. Several grasses and weeds appeared prominently in the diet in August through November.

INTRODUCTION

The wild boar (*Sus scrofa*) is a common pest animal in the irrigated crop lands of central Punjab (Beg & Khan 1982, Brooks et al. 1989, Shafi and Khokhar 1986). It also can be found in forested tracts, marshy areas, and dry thickets of acacia and mesquite, interspersed with the crop lands. It is considered the second most important vertebrate pest in Pakistan agriculture, exceeded in problems and economic losses only by the damage done by rodents in pre- and post-harvest situations.

Owing to the extensive damage it does to a variety of crops in Pakistan (Brooks et al. 1989; Shafi & Khokhar 1986), one of the essential requirements in its management is to determine the composition of the diet of the wild boar in the irrigated crop areas. Some preliminary studies on its food habits in Pakistan

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were carried out by Smiet et al. (1979) in lower Sind and by Khan (1982) in Faisalabad District. Khan analyzed 48 stomachs of wild boar and found that wheat and molasses scum were the most common items, followed by *Cyperus* tubers, maize, sorghum, cotton, mesquite pods and leaves, sugarcane, and rice. Animal remains constituted a small part of the diet.

Although many authors consider the wild boar as an omnivore, its basic foods are drawn from plants. In parts of eastern and western Europe, studies of its foods indicate that about 80 to 90% of its total food mass comes from plants (Briedermann 1976; Janda 1958; Haber 1966; Genov 1981).

The objectives of this study were 1) to determine the annual food habits of the wild boar and 2) to compare seasonal changes in food habits as the cropping patterns changed.

METHODS AND MATERIALS

Wild boar were collected by shooting from several habitats in and adjacent to Faisalabad District in central Punjab, Pakistan (Fig. 1). Approximately 50 to 100 ml of stomach contents were removed from animals at necropsy and placed into 5% formalin. Attempts were made to remove contents from both the upper and lower portions of the stomach.

Samples of the stomach contents were removed and placed on a petri dish and examined under a stereo dissecting microscope at low power. The fragments of plant or animal tissue were identified by referring to a reference collection of plant parts collected from the crop fields. The proportions of individual items were estimated to the nearest 5% in the total mass.

The main crops grown in Faisalabad District are wheat (54% of cropped acreage), sugarcane (17.8%), maize (10.4%), cotton (9.3%), rice (4.6%), fruits (citrus, mango, guava) (4.5%), mustard and rapeseed (1.2%), and millet and sorghum (about 1%) (Punjab Development Statistics 1988). Rice is grown in the late summer and

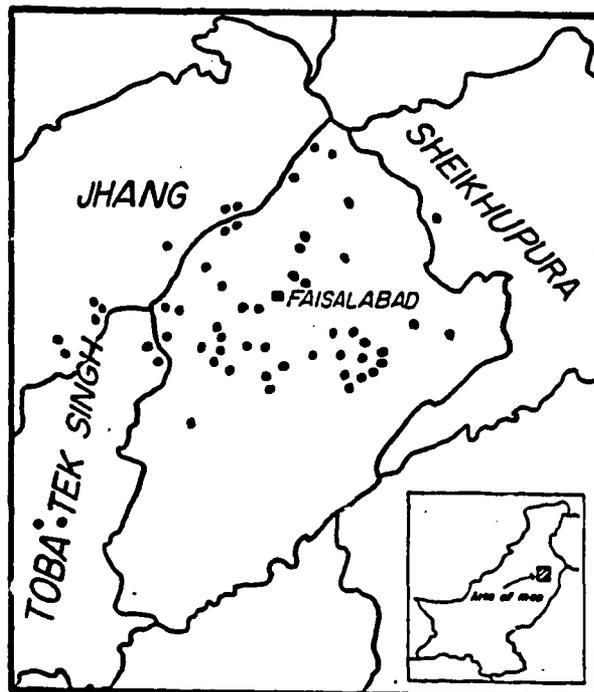


Fig. 1. Sites where wild boar were collected.

fall, while wheat is grown in early winter through spring. Interspersed with these crop areas are wastelands containing heavy growths of mesquite (*Prosopis juliflora*) and acacia (*Acacia arabica* and *A. modesta*) and marshy areas with dense growths of *Saccharum* spp. and *Typha* spp., usually in low-lying areas near rivers and canals. The admixture of the croplands and the waste areas provides abundant habitat for wild boar in this irrigated farming area.

The habitats where the animals were first disturbed were regarded as their habitat of use. Forty-six percent of the wild boar were collected from marshy habitat, 31% from sugarcane fields, and 17.5% from dense growths of mesquite. The remaining 5.5% came from forest and wheat, maize, and rice fields.

Availability factors for each plant or crop species were ranked by three of us who had spent considerable time in the cultivated and non-cultivated areas of Faisalabad District. Crops that were cultivated for 5 months or more (wheat, sugarcane) were rated as abundant; those with a growing season of less than 5 months were rated frequent. Crops with very limited acreages were rated as infrequent. Bean, chili, sour plum, *Ranunculus* spp. and *Cassia fistula* were rated as rare.

Preference ratings were developed for each major plant species in wild boar diets by using the formula of Chamrad and Box (1968):

$$\text{Preference rating} = \frac{\% \text{ Frequency of occurrence} \times \% \text{ of Mass}}{\text{Availability Factor}}$$

RESULTS

Food Items Identified

Twenty-seven food items were identified in the diet of wild boar. Fourteen items were cultivated plants and 12 items were non-cultivated plants comprising woody plants, grasses, and weeds. These data show that wild boar rely chiefly on herbaceous plants for the bulk of their diet. Animal matter made up only a small amount of the mass.

Fifteen items made up over 90% of the diet (Table 1). Wheat, both leaves and grains, was the predominant item both in mass and frequency of occurrence, being found in 66.7% of all stomachs. Wheat leaves predominated in samples from December to March, and grains predominated in samples from April to July. Crop plants, such as sugarcane, rice, oats, maize, and others, along with wheat, made up 74% of the total mass. In 235 of the stomachs only one item was found; the remainder contained 2 to 5 items.

Table 1. Dietary items found in stomach contents of wild boar collected from Faisalabad District and adjacent areas.

Food	% of Mass	Freq.	AF	PR
Cultivated Plants:				
Wheat (<i>Triticum aestivum</i>)	54.7	262	4	3583.0
Sugarcane (<i>Saccharum officinarum</i>)	8.6	64	4	138.0
Rice (<i>Oryza sativa</i>)	3.6	20	3	24.0
Oat (<i>Avena sativa</i>)	0.8	8	2	3.2
Maize (<i>Zea mays</i>)	1.6	8	3	4.3
Chickpea (<i>Cicer arietinum</i>)	0.6	4	2	1.2
Peas (<i>Pisum sativa</i>)	0.9	4	2	1.8
Mustard (<i>Brassica campestris</i>)	0.7	5	2	1.7
Vegetable	1.0	8	2	4.0
Bean (<i>Vigna spp.</i>)	0.2	1	1	0.2
Chili (<i>Capsicum frutescens</i>)	0.2	1	1	0.2
Lucerne (<i>Medicago sativa</i>)	0.2	1	3	<0.1
Gawara (<i>Cymopsis atragonaloba</i>)	0.2	1	3	<0.1
Guava (<i>Psidium guava</i>)	0.7	5	2	1.7
Non-cultivated Plants:				
Mesquite (<i>Prosopis juliflora</i>)	7.2	43	4	77.0
Acacia (<i>Acacia arabica</i>)	0.9	10	4	2.2
Shishum (<i>Dalbergia sissoo</i>)	1.0	8	3	2.7
Sour Plum (<i>Cordia mixa</i>)	1.1	6	1	6.6
Zizyphus jujuba	0.4	5	2	1.0
Sorghum halapense	1.1	6	4	1.6
Cyperus rotundus	1.8	15	3	9.0
Echinochloa spp.	1.6	8	3	4.3
Grasses (leaves)	2.9	20	3	19.0
Weeds (leaves)	1.6	16	3	8.2
Cassia fistula	<0.1	1	1	<0.1
Ranunculus spp.	0.2	2	1	0.4
Unidentified Plants	3.1	20	-	-
Animal Tissue	2.5	17	-	-
Mud & Soil	0.6	8	-	-

Percent of mass = % of total stomach contents

Frequency = Number of stomachs of occurrence

AF = availability factor (rare = 1, infrequent = 2, frequent = 3, abundant = 4)

PR = preference rating (Percent of mass x Freq./AF)

Wheat showed the highest preference rating, followed by sugarcane, mesquite, rice, grasses, *Cyperus*, weed leaves, sour plum, maize, *Echinochloa*, and vegetables. These preferences are reflected in the crop damage that wild boar inflict on wheat, sugarcane, rice, maize, and vegetables. Their rooting after the tubers of *Cyperus rotundus* are often extensive.

The animal matter consisted primarily of white fleshy tissue, probably the flesh of frogs and toads. One stomach contained ants, but no trace was seen of earthworms. Wild boar frequently root for earthworms along damp watercourses.

Seasonal Changes in Diet

There were pronounced changes in diet as cropping patterns changed. Wheat first became prominent in December; wheat leaves comprised most of the diet through March. Wild boar are capable of, and do, regurgitate the stems and awns of wheat as a bolus. Leafy matter passes on through the digestive tract. Beginning in April and continuing through June, wheat grains became the major dietary item. These trends are given graphically in Figs. 2 and 3. Figure 2 depicts the seasonal changes in diet as derived from percent of mass in the total stomach contents. Figure 3 depicts the changes as determined from frequency of occurrence of food items in wild boar stomachs.

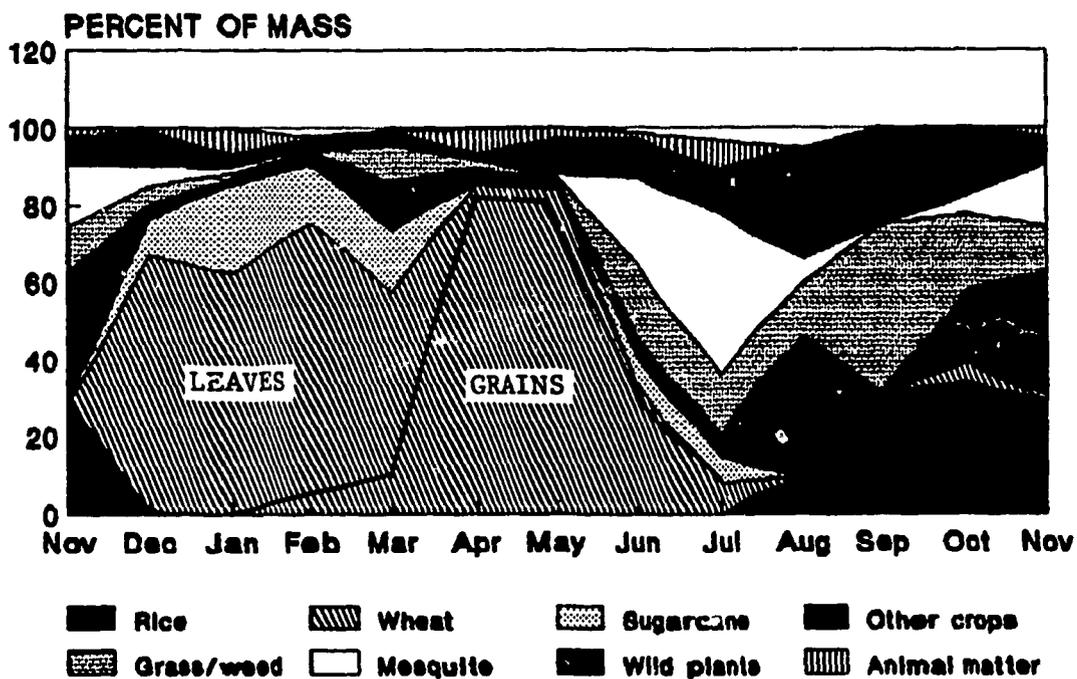


Fig. 2. Monthly changes in dietary items of wild boar based on percent of mass.

Rice began to appear in August and by October, it predominated, tapering off in December. Sugarcane first appeared in October, peaked in January and was finished in March.

Oats appeared as a contaminant in wheat fields in March through July.

Mustard is seen in October through February, since it frequently is grown as a fodder crop intermixed in wheat fields. It is cut selectively in the fields before the wheat matures.

Among the non-cultivated plants, mesquite comprised an important part of the diet in June and July, following wheat harvest. Grasses and weeds, mainly the leaves and occasionally the seed heads, became important dietary items beginning in June, continuing into November.

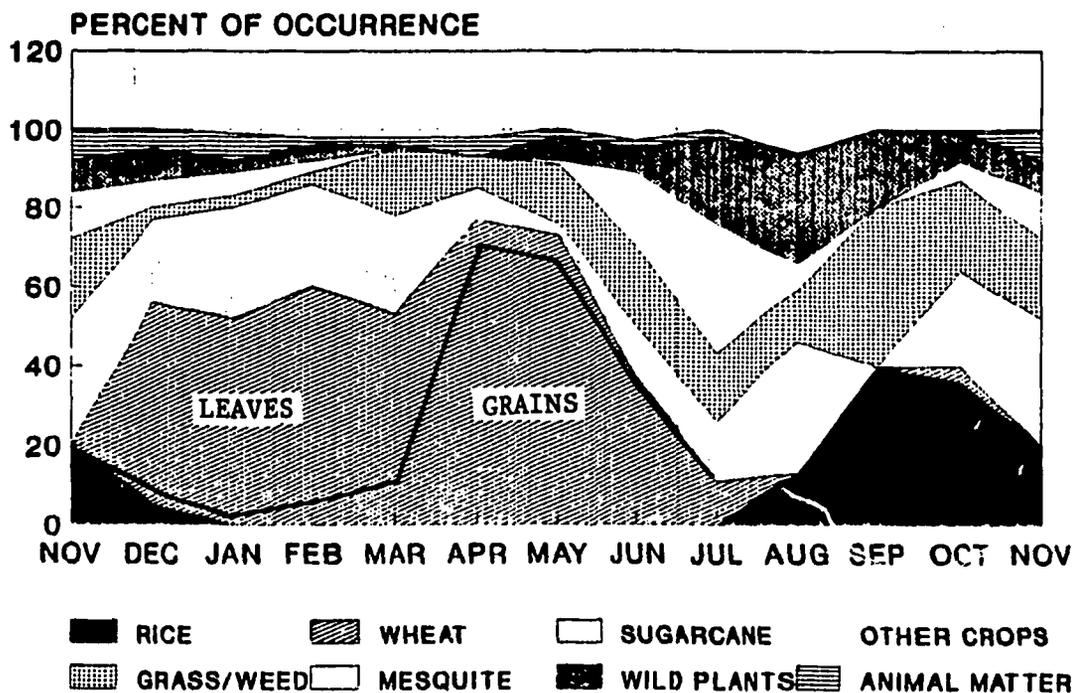


Fig. 3. Monthly changes in dietary items of wild boar based on frequency of occurrence.

Influence of Habitat on Diet

The influence of habitat on diet was examined and results are given in Table 2. Since 45% of the wild boar were collected from marshy areas, one might expect that *Saccharum*, *Typha*, or *Scirpus* species would be found in the diet. Surprisingly, none of these items were seen, indicating that wild boar were feeding elsewhere and using the marshy areas only for day time resting sites.

Wild boar from maize fields also were negative for maize. In sugarcane and mesquite, 32 to 33% of animals collected from these habitats had eaten there.

Boar taken from wheat and rice fields had heavily fed upon the crops.

These data indicate that in most cases wild boar are utilizing marshy areas, mesquite, and sugarcane fields as day time resting sites, and going elsewhere to feed during the night time hours.

DISCUSSION

Wild boar were known to damage wheat and in our own surveys in Faisalabad District in 1986, we recorded 3% damage by this animal to the wheat crop (Ahmad et al. 1986). The early grazing by wild boar, before booting stage, may actually be

Table 2. Animals taken from several habitats with food from that habitat in their stomachs.

Habitat	No. collected	No. with habitat food
Marsh	179	0
Sugarcane	123	40
Mesquite	69	23
Wheat	12	10
Rice	6	5
Maize	3	0

beneficial, and increase tillering. But all grazing after the booting stage would be detrimental and represent a loss. It appears that from April on to harvest, wild boar feed extensively upon wheat grains, causing a direct loss of production. Our findings that wheat is the predominant dietary item are in agreement with the earlier results of Khan (1982).

Wheat is an important dietary element during the period of mating and pregnancy in the female wild boar. Mating activity first takes place in late December (Ahmad et al. In press) at the time that wild boar are grazing on the leaves of wheat plants. Littering of young takes place mainly in April through June, at the time when wild boar are feeding heavily on wheat grains. Thus, the breeding of wild boar in Pakistan appears to be in synchrony with the growth and maturation of wheat.

Wild boar use sugarcane and marshy areas as habitat during the daytime hours, but appear to feed in other areas in most cases. No evidence of *Scirpus* or *Typha*

plant materials were found in the stomachs. In many cases, wild boar, originally disturbed from sugarcane fields, had wheat in their stomachs.

Alternate plant foods that sustain wild boar during intervals between crops are mesquite, grasses (mainly *Cyperus*, *Echinochloa*, and *Sorghum halapense*) and weeds. After wheat harvest, wild boar retreat to thickets of mesquite and acacia or into low-lying marshy areas of *Typha*, *Saccharum* and *Scirpus*. At this time, there are very few crops in the fields. Mesquite evidently is one of the foods that sustains them in June and July. Although potato did not show up in any of the stomachs, it is eaten by wild boar in the Faisalabad area.

Wheat appears to be highly preferred, according to its preference rating. Other foods with high preferences are sugarcane, mesquite and rice. Among the lesser eaten items preferred are tubers of *Cyperus rotundus*, leaves of grasses, and sour plum (*Cordia mixa*). It is surprising that maize is not better represented in the collections, since wild boar considerably damage this crop in season.

Genov (1981), working in Poland, found that cultivated plants made up 71% of the total mass and occurred in 89% of the 181 stomachs. Plants formed 91% of the total mass and occurred in 99% of the stomachs. Animal food comprised 9% of mass and was found in 47% of the stomachs, but was not considered of real importance in the diet of the wild boar. We found that cultivated plants in Punjab made up 74% of the diet. All plants formed 96.9% of the total mass and animal food only 2.5%.

The impact of wild boar on the cultivated crops is significant. Reduction of damage by wild boar to crops is amply justified if adequate measures of wild boar control can be developed. At present it appears that lethal control through shooting, snaring, and poisoning is the most promising solution.

The wild boar may be considered as belonging to the central Punjab agroecosystem, primarily as a primary herbaceous consumer. It also frequents mesquite /acacia thickets, forested areas, and low-lying marshy habitats set amidst the croplands. This admixture of habitat types allows the wild boar to easily exploit the several crops in season. Their diet in central Punjab could be characterized as high in energy, moderate in protein and high in fiber most of the year. This is borne out by the excellent physical condition exhibited by most of the collected animals.

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