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Evaluation of a Novel Technique to Detect the Presence and Attraction of Wild Boar (*Sus scrofa*) towards Baiting Points

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ABSTRACT

The main aim of this study was to evaluate the effectiveness of waste motor oil as a tool for detecting the presence of wild boar in forested environment and attracting them towards poison baiting sites/points. The study was conducted at two different locations, Muzafferabad, AJK and Attock, Punjab, Pakistan. The waste motor oil was applied on ground surface at 14 sites at both locations, each one measuring 2x2 square meters near established bait stations where wild boars had been regularly observed. The results indicated that wild boar activity of digging of soil surface, rolling over oily surface and fresh foot prints were found more toward treated sites compared to non-treated sites which indicated that wild boars have been attracted towards waste motor oil sites. These results suggest that scent based lures/bait such as waste motor oil is effective for detecting the presence of wild boars in forested environments and crop lands where quick assessment of population is required.

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Authors' Contribution
IA, US, ZP: Conceived and designed the study. IA, US, ZP, MM: Performed field work and data collection. US, ZP: Analyzed data. IA, US: Wrote the original draft, review and edited final version of manuscript. IA: Supervision.

Key words
Attractant, Lure, Feral swine, Waste motor oil, Scent rubbing

INTRODUCTION

Wild pigs are native of Eurasia but now they occur all over the world having 14 to 23 subspecies which include both endemic and invasive species. Wildlife management actions are always performed for managing wild pigs, most specifically in the areas where there is a risk of damage to human health and agricultural crops (Mayer and Brisbin, 2009). Beside damage to human health and agricultural crops wild boar also cause infection to livestock and wildlife in Spain, because it is a host for Foot and Mouth disease and bovine tuberculosis (Gortázar *et al*., 2008). Feral pigs are generalists so they survive in greater range of habitat and their omnivorous nature allows them to eat different kind of food sources. Mostly their diet includes seeds, forbs, soft and hard mast such as roots, shoots, tubers, and grasses. The diet of feral pigs also changes seasonally i.e., they consume nuts like a corn and hickory which are two important food items (Mungall *et al*., 2001). The diet of wild pigs also includes invertebrates such as earthworms, centipedes, beetles, leeches, grasshoppers, eggs of ground nesting birds (Hellgren, 1993).

Pakistan being Islamic country, it is not hunted on large scale as an economic resource for consumption as it is forbidden to consume by Muslims. Also, there is very less number of predators to predate on it which is not able to pull down the existing population in the areas of high infestations. Environmental groups, agricultural producers and public health officials are worried by the wide distribution and rapid increase in the number of wild boars.

Both wild and domesticated pigs possess keen sensory abilities, encompassing evolutionary advantages and disadvantages. Wild boars rely on their nose tickling sense of smell to locate food, detect potential threats, and engage in communication with other members of their species. Most commonly, wild pigs are attracted towards a food commodity like grains of corn or maize as baiting material. The frequency of wild boar visitation to baiting locations/stations can fluctuate due to factors such as the presence of natural food sources, human interference, and the acceptance of new food sources, devices, and activities (Lavelle *et al*., 2017). Birch wood tar has been used as an

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attractant to confirm the presence of wild boar in an area. It was observed that these animals consistently left a higher number of activity signs, such as rubbing, tusk marks, and rooting, in the vicinity of trees treated with this substance compared to control trees treated with water (Massei *et al*., 2021).

Reliable methods for detecting the presence of wild pigs are required, especially in regions where the species is sparsely distributed. These methods are crucial for monitoring natural range expansion, identifying the potential introduction of wild boars into new areas, whether intentional or accidental, and assessing the success of eradication efforts. These methods mainly involve the use of baited traps, deployment of carcasses or bait to attract those animals which are potential survivor, and on those pigs equipped with tracking devices to locate remaining groups of pigs (Cruz *et al*., 2005; Parkes *et al*., 2010).

The objective of this study was to evaluate the effectiveness of a potential attractant such as waste motor oil, to detect the presence and to attract the wild boar towards baiting points in forested environments and crop lands.

MATERIALS AND METHODS

Study area

This study was carried out at two different locations i.e., village Basnaraha (Union Council Chatter Klass), District Muzaffarabad, Azad Jammu and Kashmir (AJ & K) and Union Council Mirza, District Attock, Punjab Pakistan. The district Muzafferabad is situated at coordinates N 34.359688 and E 73.471054, with elevations ranging from 737 meters to 1103 meters above sea level, covering a total area of 1642 square kilometres. The district receives an average annual rainfall of 1457 mm, with an average annual temperature of 20.2°C. Light snowfall in winter is a common occurrence in the mountains adjacent to Chatter class. The study area features a variety of habitats, including rivers, thickly vegetated areas and green fields. Major agricultural crops like wheat, maize, rice, and vegetables are grown in this area (GOAJK, 2013). Muzaffarabad's topography is characterized by mountainous and hilly terrain, featuring subtropical scrub and pine forests.

The Attock district is situated on the northern border of Punjab, positioned at 33.768051 North Latitude and 72.360703 East Longitude. It is located at an elevation of 384 meters above sea level. This region is categorized within agro-ecological zone-V, Barani (PARC, 1980). Climatically, the area adjacent to the mountains is relatively humid, while the southern part is semi-arid and experiences hot conditions. The average monthly rainfall typically amounts to around 200 mm during the summer months and ranges from 36 to 50 mm in the winter. The major crops cultivated in the area include maize, groundnuts sorghum, wheat, millet, legumes and mustard (Rashid and Rasul, 2011).

Experimental design

The research trials were conducted in Attock district during the month of March 2023, in wheat crop at maturity stage and Muzafferabad district during the month of May, 2023 in forest plantations. A cheap lubricant (waste motor oil) was evaluated as an attractant for attracting wild boar towards baiting points. The study aimed to determine whether these animals visited treated sites with the attractant more frequently compared to control sites. It was chosen for two reasons (i) it was the direct observation of local farmers in the field that this lubricant act as an attractant for wild boar and (ii) wild boars are used to roll over the waste motor oil on the soil surface to kill its ticks and mites on its thick body hairs (in majority cases reported by local farmers).

In both research trials, waste motor oil was applied on ground surface measuring 2x2 square meters near established bait stations (baiting points). Each bait station was at least 800-1000 meters apart. Bait stations were selected randomly where wild boars had been regularly observed in an area. Overall 14 baiting points were established in each location (i.e. seven control sites and seven treated sites). Culled poultry heads were applied as a new bait delivery system at each bait station of both treated and control sites (Khan *et al*., 2011). Counted number of poultry heads and 50 ml motor oil was applied late in the evening before sunset and data was recorded next day early in the morning. Left over poultry heads were picked up to avoid consumption by non-target animals. Poultry heads were placed approximately 1 meter near the baiting points where motor oil was applied to see the consumption preference trend, compared to control sites. Consumption data was recorded for consecutive five days at both locations. Foot prints of wild boar, digging of soil surface and rolling over oily surface by wild boar were recorded from all bait stations where motor oil was applied.

Statistical analysis

Analysis of variance (Statistix 8.3) software was used to compare the consumption of bait towards treated and control sites with wild boar activity signs.

RESULTS

At both locations, wild boar activity of digging of soil surface, rolling over oily surface and fresh foot prints were

found more towards treated sites compared to control sites (Fig. 1). Moreover, no activity of any non-target species was observed near treated bait stations which suggest that waste motor oil did not act as an attractant for non-target species.

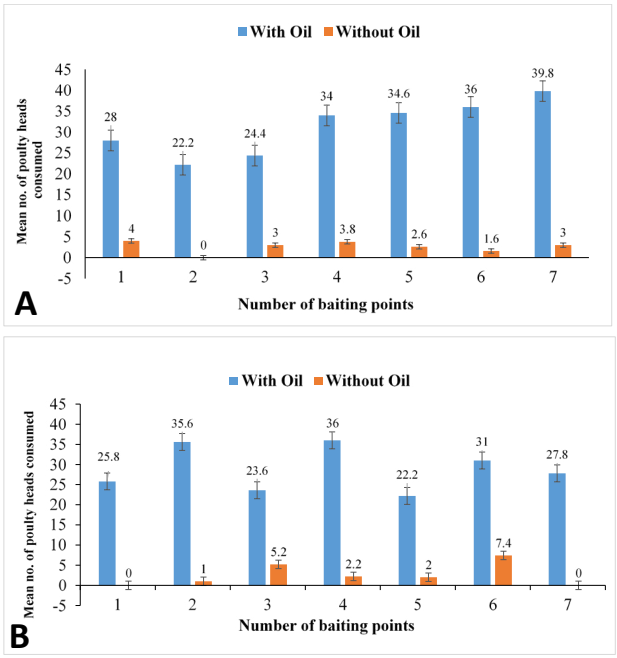

Fig. 1. Comparison in consumption of poultry heads from all bait stations in Muzaffarabad, AJ & K (A) and Attock (B).

Results showed that 93.19% of bait was consumed from those bait stations where waste motor oil was applied while only 8.73% bait was consumed where this lubricant was not applied. The application of waste motor oil to bait stations had significantly increased wild boar visitation and bait uptake in Muzafferabad ($F = 257.74$, $df = 1$, $P < 0.001$) and Attock district ($F = 424.53$, $df = 1P < 0.001$). In Muzafferabad, a total of 1175 poultry heads were placed at 7 bait stations by using waste motor oil and out of this 1095 were consumed. While, 1030 poultry heads were placed where waste motor oil was not applied and out of this 90 poultry heads were consumed (Fig. 1A).

In Attock, a total of 1075 poultry heads were placed at 7 bait stations by using waste motor oil and out of this 1010 were consumed. While, 875 poultry heads were placed where waste motor oil was not applied and out of these 89 poultry head were consumed. Results showed that 93.95% of bait was consumed from those bait stations where waste motor oil was applied while only 10.17% bait was consumed from points where this lubricant was not applied (Fig. 1B).

Overall, high bait consumption and attraction of wild boar was recorded in Muzafferabad followed by Attock. In Muzafferabad, mean consumption of poultry heads towards treated and control site was 31.286 and 2.571 recorded respectively, and in Attock, similar pattern of consumption of poultry heads towards treated and control site was recorded, i.e., 28.857 and 2.542, respectively (Fig. 2).

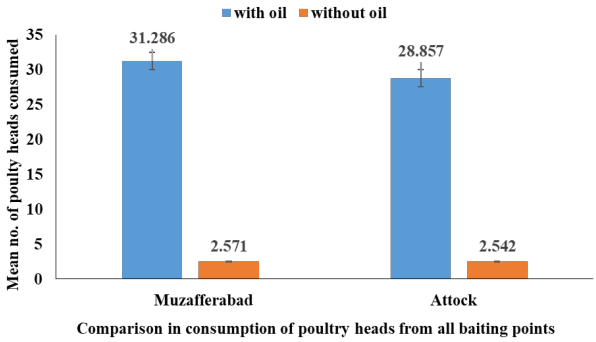

Fig. 2. Comparison in consumption of poultry heads from all bait stations at Muzafferabad and Attock.

DISCUSSION

This study confirmed that wild boars exhibited stronger attraction towards treated sites where waste motor oil was applied compared to non-treated sites. The higher number of wild boar activity signs was observed from the areas where waste motor oil was applied which suggests that it can be used as an attractant to confirm the presence or absence of wild boar in an area. Waste motor oil was applied in the areas which were used as a regular pathway by wild boar. This lubricant might have attracted wild boars from neighbouring areas too. Wild boars emigrate from their core habitats and enlarge their range (Spencer and Hampton, 2005; Wilson, 2013).

Scent-rubbing is a poorly understood behaviour in which mammals rub their body bizarre array of substances, any of which have strong odours such as waste motor oil in the present study. Scent rubbing has attracted a variety of functional interpretations but no consensus has emerged so far. Explanations include comfort behaviour and increasing social attractiveness, i.e., status advertisement (Gosling and Mckay, 1990). Further studies are required to explain scent marking behaviour of mammals using camera traps.

Limited efforts have been made so far to identify the presence of wild boars in a particular area. Some attractants like food additives and some lures have been used to test the effectiveness of these attractants (Lavelle *et al*., 2017; Sandoval *et al*., 2019). Sometimes food attractants are not effective source of attractants because of availability of

natural food resources which may limit the attraction of wild boars towards such attractants (Lavelle *et al*., 2017).

When attracting targeted animals to traps then species specificity is important so that trapping of non-targeted species can be minimized. The specificity of the attractant is also important for attracting wild boars to bait that contains substances like toxins, vaccines, or contraceptives. This issue can only be solved by using boar operated system/bait delivery system (BOS) specifically designed to prevent bait consumption by non-target species (Massei *et al*., 2010; Campbell *et al*., 2011; Ferretti *et al*., 2014).

Scent based lures are effective for several weeks and do not require replacement very often as compared to food attractants (Sandoval *et al*., 2019). The use of waste motor oil in current study offered several advantages over other attractants which were previously employed: (1) little cost, as it is cheap and easily available from local motor workshops and 3.5 litres were used on the surface of 7 baiting points/sites (2) effectiveness, there is limited staff effort for initial application and monitoring the effect of attractant during subsequent visits; (3) no effect on non-target species; (4) it is an effective attractant for wild boar in all seasons even when natural food is available; (5) anticoagulant baits were successfully used against wild boar (Khan *et al*., 2017). As anticoagulant baiting takes 17 days, this method will facilitate the regular visiting of wild boar towards the baiting points just from the start of control operation.

CONCLUSION

It can be concluded that waste motor oil is a potential attractant which can be used to attract wild boars towards baiting points and detect their presence in the areas which are newly colonized by these animals or the areas where density of wild boar is low. Further experiments must be performed to detect the presence of wild pigs in newly colonized sites, or the areas which have relatively low-density species. Moreover, further studies can be performed to access whether waste motor oil could enhance the effectiveness of trapping or attracting these species towards areas where poison baits are delivered in special devices like wooden boxes (environmentally safe bait dispensers) and other bait delivery systems like furrow baiting in different field crops.

DECLARATIONS

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IRB approval

The authors would like to confirm that the study protocol for this study was reviewed by the independent ethics committee.

Ethical statement

The authors comply with all the laws and regulations that apply to science and profession during the period of studies.

Statement of conflict of interest

The authors have declared no conflict of interest.

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