No Corn, No Problem: A Test for the Best Non-Grain Attractant for Wild Pigs

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Abstract: Grain-based attractants (e.g., corn) are standard among most wild pig (*Sus scrofa*) trapping and non-invasive sampling efforts (e.g., genetic spatial capture/recapture, camera trapping), but their use is not always feasible due to cost, deployment restrictions (e.g., difficulty of transporting grain into remote areas, property rules), and potential disease concerns associated with concentrating non-target species at bait sites. Attractant deployment and efficacy should be considered by biologists, private landowners, and researchers given the ultimate need to use attractants to attract wild pigs. To examine the efficacy of potential non-grain attractants, we used remote camera grids to identify attractant(s) that maximized wild pig visitation while minimizing non-target species visitation in a forested landscape in the southeastern United States. Further, we only considered non-grain attractants easy to carry (i.e., <0.5 kg and compact) and deploy (i.e., painted on tree trunks or activated scent wicks). Comparing eight non-grain attractants among food, non-food, and control (i.e., no attractant; $n = 11$ visitations) treatments, we found used cooking oil (i.e., fish fryer grease; $n = 38$ visitations), orange marmalade ($n = 36$ visitations), and caramel syrup ($n = 29$ visitations) were most attractive to wild pigs. Although also attractive to opossums (*Didelphis virginiana*; $n = 50$ visitations), used cooking oil was not a significant attractant among other non-target species. In contrast, orange marmalade was attractive to raccoons (*Procyon lotor*), opossums, and eastern gray squirrels (*Sciurus carolinensis*; $n = 188$ combined visitations), and caramel syrup was attractive to raccoons and opossums ($n = 137$ combined visitations). In our study, used cooking oil was the non-grain attractant most likely to maximize wild pig visitation while minimizing non-target species attraction, and increases the efficacy of sampling of remote areas considering its ease of distribution.

Keywords: camera trap, caramel syrup, cooking oil, non-target, orange marmalade

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Successful wildlife management and conservation depends on the ability to properly assess target species distribution, population size, and trends (Saracco et al. 2008, Kindberg et al. 2011). This is particularly important for exotic species as their distributions and populations may rapidly expand into new environments due to life history characteristics that often include a wide range of environmental tolerance, a broad or generalist diet, early sexual maturity, prolific reproduction, dispersal ability, and absence of natural enemies (Ricciardi and Rasmussen 1998, Sakai et al. 2001, Jeschke et al. 2012). The inconspicuous habits (e.g., nutria, *Myocastor coypus*; Witmer and Pitt 2012) along with human phobia (e.g., black rat, *Rattus rattus*; Phillips 2010) among mammalian exotics often make use of direct, invasive field methods laborious or otherwise logistically challenging (Van Rensburg et al. 1987). As a result, non-invasive methods are often used to assess distribution and population size, including those that benefit from the use of attractants (e.g., camera trapping, hair snaring, scent stations; Ferreras et al. 2018, Gurney et al. 2020, Holinda et al. 2020). Attractants have

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a variety of uses in wildlife management and research relating to exotic species including trapping (Reed et al. 2011), toxicant delivery (Engeman et al. 2006), and population abundance estimation (Amburgey et al. 2021). Although attracting a target species is critically important in each application, minimizing non-target visitation may be of equal or greater importance especially when lethal methods and/or sensitive species are involved (Glen et al. 2007).

Wild pigs (*Sus scrofa*) are tolerant and adaptable to various environmental conditions (Barrett and Birmingham 1994) and have a generalist omnivorous diet (Ditchkoff and Mayer 2009), early age of sexual maturity (Dzieciolowski et al. 1992), high reproductive capacity (Ditchkoff et al. 2012), and efficient dispersal ability (Snow et al. 2017), traits that facilitate population expansion and establishment. Although present in North America since the 1500s (Lewis et al. 2019), wild pigs have increasingly presented challenges to natural resource managers, biologists, and private landowners in recent decades as populations and distributions have continued to expand (Corn and Jordan 2017), leading to concomitant increases in agricultural damage and control costs (McKee et al. 2020). Management actions often include active removal methods (e.g., trapping, shooting, aerial gunning; Barrett and Birmingham 1994, Massei et al. 2011). However, research may also benefit from an improved understanding of attractant efficiencies. Grains (e.g., corn, wheat) are common baits (Lavelle et al. 2017) used in wild pig population assessments (Davis et al. 2020, Schlichting et al. 2020) and control efforts (Poche et al. 2018). However, grain loses appeal when considering its attractiveness to non-target species (a quality that can augment, for example, disease transmission; Miller et al. 2003), increased costs (Lavelle et al. 2017), and deployment feasibility in grain-restricted areas (e.g., national wildlife refuges, wildlife management areas, disease management zones) that harbor wild pig populations.

Non-grain attractants such as liquid domestic swine feed additives (e.g., apple and strawberry; Campbell and Long 2008) and orange flavoring (Karlin and Khan 2020) may provide alternatives for attracting wild pigs, especially when grain deployment is not an option, and have been shown to be effective in some cases. For example, use of orange flavoring with grain was shown to have greater visits from wild pigs and fewer visits from non-target species such as white-tailed deer (*Odocoileus virginianus*) and raccoon (*Procyon lotor*) relative to grain-only stations (Karlin and Khan 2020). However, non-grain attractants for wild pigs, even when used alone, can still attract non-target species (Campbell and Long 2008). When effective, non-grain attractants may aid in reducing costs and labor required to meet management and research objectives. For example, a non-grain attractant (e.g., jelly; Andelt and Woolley 1996) may represent a cost-efficient and less labor-intensive alternative that allows for a greater deployment range into remote or otherwise access-limited areas. However, while attractants may be effective in one region or ecotype, complementary investigations in new areas are warranted considering differences among non-target communities, local climatic conditions, and the availability of food resources.

Previous attractant studies have focused on wild pig populations and broader communities among countries (e.g., Australia; Elsworth et al. 2004), coastal islands (e.g., Ossabaw Island, Georgia, USA; Kavanaugh and Linhart 2000), private lands characterized by shrub rangelands (e.g., Texas; Campbell and Long 2008, Karlin and Khan 2020), and state-owned wildlife management areas with distinct wild pig hunting seasons (e.g., Alabama; Sandoval et al. 2019). While most studies focused on food-based attractants, investigation of urine-based attractants (Sandoval et al. 2019) may also be useful, particularly on public lands (e.g., national wildlife refuges) where food-based attractants may be precluded in certain areas due to baiting, feeding, hunting seasons, or access rules and restrictions. Our objective was to evaluate the effectiveness of eight commercially available, non-grain attractants for wild pigs within a forested landscape in the southeastern U.S. that would maximize attraction of wild pigs and minimize attraction of non-target species. We used both food and non-food non-grain alternatives to assess potential for implementation considering access, time, and grain baiting restriction challenges for stakeholders working on public lands.

Study Area

We tested attractants at the Sam D. Hamilton Noxubee National Wildlife Refuge (NWR) during summer (17 June–30 July) 2021. The study area encompassed 19,425 ha in east-central Mississippi (Figure 1) with bottomland hardwoods (i.e., woody wetlands; 52.2%) and upland forests (i.e., evergreen, deciduous, and mixed; 40.4%) collectively dominating the landscape, while remaining land cover types (e.g., water, developed) comprised the remaining 7.4% (Dewitz 2019). In addition to the presence of wild pigs since 2014, other mammals of interest included white-tailed deer, raccoon, bobcat (*Lynx rufus*), coyote (*Canis latrans*), nine-banded armadillo (*Dasypus novemcinctus*), Virginia opossum (*Didelphis virginiana*), and eastern gray squirrel (*Sciurus carolinensis*; hereinafter, gray squirrel). Annual precipitation totaled 162.6 cm, and average monthly low and high temperatures ranged 0.6–22.2 C and 12.2–32.8 C during the study year, respectively (NOAA 2023). During the study period, precipitation totaled 21.2 cm, and average low and high temperatures ranged 21.2–31.9 C, respectively (NOAA 2023). While public hunting pressure was relatively high for native mammals (e.g., white-tailed deer, gray squirrel) during

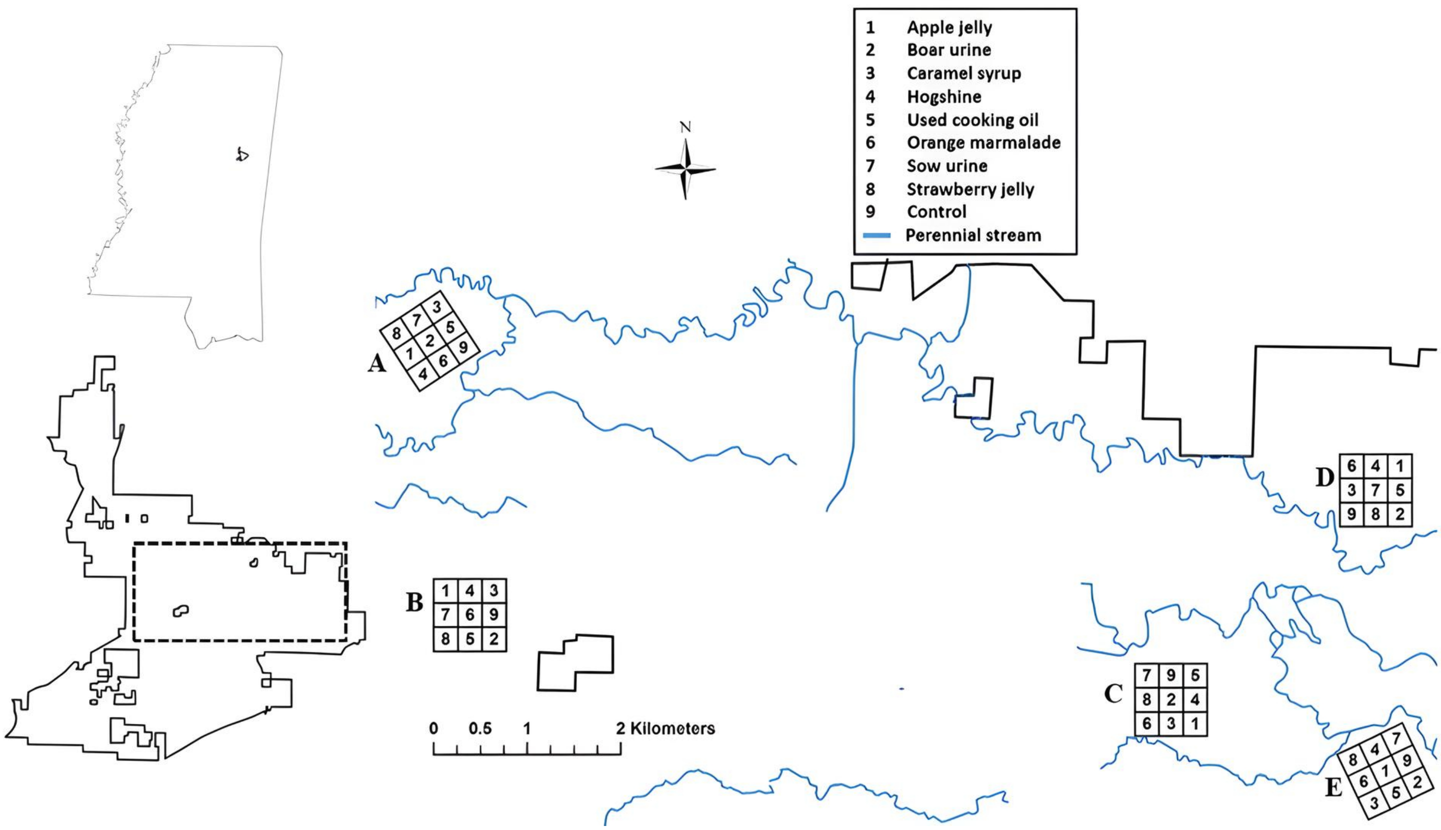

Figure 1. Location of the Sam D. Hamilton Noxubee National Wildlife Refuge in Noxubee, Oktibbeha, and Winston counties, Mississippi (top left), with sample area grid locations within the refuge (bottom left) and assigned treatments at grid locations (right) during an investigation of non-grain attractants for wild pigs (*Sus scrofa*).

respective hunting seasons, wild pig removal was limited to incidental take (i.e., approximately 100 wild pigs yr^{-1}, T. Carpenter, Sam D. Hamilton Noxubee NWR, pers. comm.) during native game hunting seasons. Although precise population estimates were not currently available, the wild pig distribution was primarily limited to the woody wetlands land cover type across the central region of the study area (Figure 1).

Methods

Sampling Design

We detected and GPS-marked rooting and wallowing areas during previous wild pig damage surveys in 2020–2021. Based on damage predominantly occurring within woody wetlands, we placed five attractant sampling areas (Figure 1) in damaged areas within this land cover type using ArcGIS (ESRI 2017). A 3 × 3 grid was overlayed in each area and a centroid location was generated in each cell to represent the location of each randomly assigned treatment (Figure 1). We used a grid size representing the smallest home range size reported for wild pigs in the region (0.6 km^2; Hartley et al. 2015) to ensure availability of each treatment to a given wild pig with enough separation (approximately 200 m spacing) among treatments to suggest an individual was attracted to that treatment and not an accidental "combination" of adjacent scents (Campbell and Long 2008). Grids were also oriented to avoid perennial streams, a potentially confounding variable (i.e., as streams provide travel corridors; Beasley et al. 2014). Although each grid was monitored for 14 days, monitoring periods were staggered (i.e., grids A and B: 17–30 June 2021, grid C: 2–15 July 2021, and grids D and E: 17–30 July 2021) due to the number of available cameras (see below).

Treatment Application and Monitoring

At each sampling grid centroid, we randomly assigned nine treatments for the duration of the monitoring period as follows: used cooking oil (i.e., fish fryer grease); orange marmalade (Great Value, Arkansas), strawberry jelly (Smuckers, Ohio), apple jelly (Smuckers), and caramel syrup (Smuckers); Hogshine, which is a commercial grain additive (Yawt Yawt, Mississippi); sow in heat urine (BoarMasters Wildlife Attractants, Idaho), dominant boar urine (BoarMasters Wildlife Attractants, Idaho); and a control (camera only; Figure 1). Non-urine treatments consisted of a weekly application to the same tree (i.e., 192 mL, equivalent to half standard jar per application), and urine treatments consisted of a weekly application to a key wick (Wildlife Research Center, Minnesota) hung from the same tree branch (i.e., 7 mL, the maximum amount that could be applied without exceeding wick absorption capacity). Initial applications and camera installations were completed on the day that preceded monitoring (i.e., day 1 started at midnight), and second applications and camera checks (i.e., battery checks and memory card changes) occurred on day 7. Monitoring of species visitation was conducted using a motion-sensing remote camera (FORCE-20; Spypoint, Quebec, Canada) located 5 m from the treatment with each camera set to capture three-image bursts at high sensitivity without delay. During the first monitoring period, cameras were placed 1 m above ground level; however, due to flash flooding concerns within woody wetlands, camera height was increased to 1.5 m on day 2 for all cameras. We maintained the adjusted height for the remainder of the study period in every grid. All procedures were in accordance with Sam D. Hamilton Noxubee NWR guidelines (U.S. Fish and Wildlife Service Permit #43620-20-013).

Figure 2. Wild pig (*Sus scrofa*) sounder visiting a used cooking oil attractant in the Sam D. Hamilton Noxubee National Wildlife Refuge in Noxubee, Oktibbeha, and Winston counties, Mississippi, during an investigation of non-grain attractants for wild pigs (*Sus scrofa*).

Statistical Analysis

Wild pigs in our study area are often uniform in coloration, and therefore, difficult or impossible to individually identify (Figure 2). Considering our inability to reliably identify individuals across all mammal species and our interest in visitations rather than abundance estimation (Kelly and Holub 2008), we defined a visitation event as a mammal species observation (regardless of number observed during the event) within the camera frame ≥10 min since the last observation of that species on camera (Karlin and Khan 2020). To reduce potential biases when processing remote camera images, we had the same two people review all images across all grids. Due to overdispersion of the species occurrence data from substantial non-detections, a negative binomial generalized linear model ('MASS' package; Venables and Ripley 2002) was fit for each species with ≥30 visitation events in R (R Core Team 2021). We used our finest scale count data (i.e., visits per day for each treatment in each grid; $n = 5$ replicates per treatment) as our response variable with attractant treatment as a predictor and the control treatment set as the base comparison. We determined statistical significance at $\alpha = 0.05$.

Results

We observed no camera failures (e.g., due to dead batteries) during the duration of the study period. Flash flooding events were brief (i.e., <1 day) and did not appear to differentially impede wild pig or non-target visitation. We observed 1191 visitation events among 12 mammal species, five of which were used in our analysis including wild pig, opossum, raccoon, gray squirrel, and white-tailed deer (Table 1). Remaining species included nine-banded armadillo ($n = 21$ visits), gray fox (*Urocyon cinereoargenteus*; $n = 13$ visits), bobcat ($n = 7$ visits), fox squirrel (*Sciurus niger*; $n = 5$ visits), coyote ($n = 4$ visits), eastern cottontail (*Sylvilagus floridanus*;

Table 1. Total number of visitation events along with the mean number of visitation events (± standard error) per grid ($n = 5$) for each species and treatment during an investigation of non-grain attractants for wild pigs (*Sus scrofa*) between June and July 2021 in Noxubee, Oktibbeha, and Winston counties, Mississippi.

Attractant	Wild pig	Virginia opossum	Raccoon	Eastern gray squirrel	White-tailed deer
Used cooking oil	38 (7.6 ± 3.4)	50 (10.0 ± 4.0)	30 (6.0 ± 1.1)	14 (2.8 ± 1.6)	6 (1.2 ± 1.2)
Orange marmalade	36 (7.2 ± 3.8)	77 (15.4 ± 5.3)	73 (14.6 ± 3.6)	38 (7.6 ± 3.4)	3 (0.6 ± 0.4)
Caramel syrup	29 (5.8 ± 1.1)	89 (17.8 ± 4.5)	48 (9.6 ± 5.0)	21 (4.2 ± 1.2)	5 (1.0 ± 0.6)
Strawberry jelly	24 (4.8 ± 3.3)	52 (10.4 ± 4.3)	78 (15.6 ± 3.2)	30 (6.0 ± 3.3)	7 (1.4 ± 0.7)
Sow urine	23 (4.6 ± 1.9)	4 (0.8 ± 0.6)	38 (7.6 ± 3.2)	14 (2.8 ± 1.2)	5 (1.0 ± 0.4)
Boar urine	18 (3.6 ± 1.7)	23 (4.6 ± 4.6)	14 (2.8 ± 1.1)	13 (2.6 ± 0.9)	9 (1.8 ± 0.6)
Apple jelly	10 (2.0 ± 0.7)	39 (7.8 ± 3.8)	27 (5.4 ± 2.2)	21 (4.2 ± 0.7)	2 (0.4 ± 0.2)
Hogshine	9 (1.8 ± 1.3)	16 (3.2 ± 1.3)	22 (4.4 ± 2.0)	16 (3.2 ± 1.6)	10 (2.0 ± 0.9)
Control	11 (2.2 ± 0.8)	3 (0.6 ± 0.2)	24 (4.8 ± 3.3)	12 (2.4 ± 1.2)	5 (1.0 ± 0.4)

n = 2 visits), and unidentified Rodentia (families Cricetidae and possibly Muridae (*n* = 3 visits)). Among treatments, wild pig visitations were fewest for Hogshine and greatest for used cooking oil (Table 1; Figure 2). Used cooking oil, orange marmalade, and caramel syrup collectively maximized wild pig visitation, with these treatments being 1.24, 1.19, and 0.97 times more likely to be visited than the control, respectively (Table 2).

Among non-target species, opossums visited a variety of attractants including caramel syrup, orange marmalade, strawberry jelly, used cooking oil, apple jelly, boar urine, and Hogshine (Table 1) and were 1.67 to 3.39 times more likely to visit these attractants compared to the control (Table 2). Opossums did, however, have few visits to sow urine (Table 1). Raccoons had the greatest number of visits to strawberry jelly, orange marmalade, and caramel syrup and the least number of visits to boar urine (Table 1). Raccoons were 1.18, 1.11, and 0.69 times more likely to visit strawberry jelly, orange marmalade, and caramel syrup, respectively, compared to the control (Table 2). Gray squirrels had 1.15 times more visits to orange marmalade and 0.92 times more visits to strawberry jelly compared to the control (Table 1), with visits to other attractants not different from the control (Table 2). Finally, white-tailed deer showed no specific increase in attractant-specific visitation relative to the control (Table 1, Table 2).

Discussion

Examining diverse non-grain wild pig attractants allowed us to determine that used cooking oil was an effective attractant for wild pigs that minimized non-target species visitations. While orange marmalade demonstrated similar effectiveness in attracting wild pigs, it also attracted opossums, raccoons, and gray squirrels. Although each attractant has been shown to be successful while deployed concomitantly with grain (Higginbotham 2012, Karlin and Khan 2020), we showed that these attractants can also be effective when used independently, an especially important finding considering our preclusion to using grain in our study area. Used cooking oil and orange marmalade were generally effective in attracting wild pigs throughout our study duration (i.e., 31.4% and 30.0% of monitoring days with ≥1 visitation, respectively), but this effectiveness was most evident when comparing total visitations to those of other effective non-grain attractants identified elsewhere in the southeastern U.S. For example, used cooking oil (38 visits in 70 days = 0.54 visit day^{-1}) and orange marmalade (36 visits in 70 days = 0.51 visit day^{-1}) appeared to perform similarly well to strawberry (48 visits in 100 days = 0.48 visit day^{-1}) and apple scents (43 visits in 100 days = 0.43 visit day^{-1}; Campbell and Long 2008), and although study methodologies differed, this further demonstrates utility of alternative non-grain attractants when bait is restricted.

Table 2. Negative binomial generalized linear model *β*-coefficients with standard error (SE) and *Z*- and *P*-values for each species and treatment relative to the control treatment during an investigation of non-grain attractants (i.e., treatments) for wild pigs (*Sus scrofa*) in Noxubee, Oktibbeha, and Winston counties, Mississippi. *P*-values ≤0.05 for treatments are bolded.

Species	Treatment	β	SE	Z	P
Wild pig	Apple jelly	–0.10	0.49	–0.19	0.85
	Boar urine	0.49	0.45	1.11	0.28
	Caramel syrup	0.97	0.42	2.30	**0.021**
	Hogshine	–0.20	0.50	–0.40	0.69
	Used cooking oil	1.24	0.41	3.01	**0.003**
	Orange marmalade	1.19	0.41	2.87	**0.004**
	Sow urine	0.74	0.43	1.71	0.09
	Strawberry jelly	0.78	0.43	1.82	0.07
Virginia opossum	Apple jelly	2.57	0.64	4.01	**<0.001**
	Boar urine	2.04	0.65	3.11	**0.002**
	Caramel syrup	3.39	0.63	5.39	**<0.001**
	Hogshine	1.67	0.67	2.50	**0.012**
	Used cooking oil	2.81	0.64	4.42	**<0.001**
	Orange marmalade	3.25	0.63	5.15	**<0.001**
	Sow urine	0.29	0.80	0.36	0.72
	Strawberry jelly	2.85	0.64	4.49	**<0.001**
Raccoon	Apple jelly	0.12	0.33	0.36	0.72
	Boar urine	–0.54	0.38	–1.42	0.16
	Caramel syrup	0.69	0.31	2.26	**0.024**
	Hogshine	–0.09	0.34	–0.25	0.80
	Used cooking oil	0.22	0.33	0.69	0.49
	Orange marmalade	1.11	0.29	3.78	**<0.001**
	Sow urine	0.46	0.32	1.46	0.15
	Strawberry jelly	1.18	0.29	4.03	**<0.001**
Eastern gray squirrel	Apple jelly	0.56	0.41	1.37	0.17
	Boar urine	0.08	0.44	0.18	0.87
	Caramel syrup	0.56	0.41	1.37	0.17
	Hogshine	0.29	0.43	0.68	0.50
	Used cooking oil	0.15	0.44	0.35	0.72
	Orange marmalade	1.15	0.38	3.02	**0.003**
	Sow urine	0.15	0.44	0.35	0.72
	Strawberry jelly	0.92	0.39	2.35	**0.019**
White-tailed deer	Apple jelly	–0.92	0.87	–1.05	0.29
	Boar urine	0.59	0.61	0.96	0.34
	Caramel syrup	0.00	0.68	0.00	1.00
	Hogshine	0.69	0.60	1.15	0.25
	Used cooking oil	0.18	0.66	0.28	0.78
	Orange marmalade	–0.51	0.77	–0.66	0.51
	Sow urine	0.00	0.68	0.00	1.00
	Strawberry jelly	0.34	0.64	0.53	0.60

It was curious that other attractants used, such as strawberry and apple jelly, were ineffective in attracting wild pigs, considering their effectiveness elsewhere (e.g., Campbell and Long 2008). Although there is no definitive explanation for this disparity, local conditions and study design characteristics likely influenced wild pig preferences. For example, differences in ecoregions (South Texas Plains shrub rangeland vs. Blackland Prairie bottomland hardwood forests), climates (e.g., arid vs. humid), study timing (late summer/early spring vs. mid-summer), attractant type (commercial domestic swine additives vs. simple household items), deployment method (soaked cotton in polyvinyl capsules vs. direct application), duration between rebaiting (daily vs. weekly), and local wildlife community compositions, could have influenced wild pig choices. Our findings thus demonstrate the importance of understanding attractant efficacy at local scales, or within the context of the above listed considerations. Even our identification of orange marmalade as an effective wild pig attractant, while promising given its general consistency with other research, should be understood within local contexts (e.g., use in open landscapes vs. mock corral traps; Karlin and Khan 2020). Meanwhile, purely grain-based strategies seem more universal in attractiveness for both target and non-target species, which makes them valuable when allowed and feasibly deployed (Lavelle et al. 2017). We were also limited in our ability to identify individuals across all species examined, and therefore it is plausible to conclude that individual behaviors could lead to heterogeneity in visitations across all treatments, even within the same locality.

Attractants tested in this study represented those that performed well in other wild pig research or management applications, or those commercially produced for the purpose of attracting wild pigs. While attractant performance varied considerably for wild pigs, non-target visitation is also important to consider. Depending on objectives and the acceptable level of non-target species collateral damage (e.g., stress induced by trapping), attractant use will be accompanied by some level of risk, and we demonstrated that none of our attractants solely attracted wild pigs. However, if the aim of attractants is to support non-invasive research efforts, this obviously carries lesser direct risk to non-targets, even though indirect risks associated with congregating animals can persist, such as wildlife disease transmission (e.g., bovine tuberculosis; Cartensen et al. 2011; chronic wasting disease; Plummer et al. 2018).

Wild pig visitation with few visits by non-target species was best achieved with used cooking oil, a result unobtained by orange marmalade or caramel syrup which attracted primarily opossums and raccoons. While opossum visitation was also high for used cooking oil, raccoon visitation was not, an unexpected finding given associations between raccoons and fish-scented baits in oral pharmaceutical distributions (Campbell et al. 2006, Johnson et al. 2016) and the origin (i.e., fish-fryer) of our used cooking oil. Although we desired to identify an attractant which also minimized opossum visitation, this species was attracted to all treatments except sow urine, making minimizing opossum visitations potentially infeasible. Considering high levels of opossum visitation to other attractants (e.g., fishscent; Campbell et al. 2006, Johnson et al. 2016; molasses; Goodwin and Ten Houten 1991, chicken, catnip oil; Jordan and Lobb-Rabe 2015), and their generalist omnivorous diet (Walsh et al. 2017, Greenspan et al. 2018, Hart et al. 2019), this issue is not restricted to our study area, and other attractants will likely need to be investigated if the aim is to exclude opossums.

Our work continues to demonstrate the importance of investigating attractant preferences locally. While top attractants in the literature likely hold collective value when identifying or refining the suite of candidate attractants deployed, differences among local conditions and deployment characteristics, in addition to the generalist diet of wild pigs, may lead to variation in attractant efficacy. Although strategies may also benefit from concomitant use of non-grain attractants with grain baits, costs (e.g., US$7–10 per 22.7-kg bag of whole corn relative to $2–3 per standard jar of non-grain attractant), deployment feasibility (e.g., difficulty of transporting grain baits into remote areas), and potential drawbacks (e.g., disease risks associated with concentration of non-target species such as raccoon and white-tailed deer at grain bait sites, accelerated depletion of grain by non-targets), collectively undermine the value of deploying grain in many situations and suggest the need for non-grain alternatives. Combining or alternating non-grain attractants could increase visitation rates supporting various objectives including abundance estimation (e.g., via spatial capture-recapture methods), keeping sounders interested during trap construction, and attracting new individuals otherwise unattracted to non-grain attractants. Researchers and managers are encouraged to explore such combinations and evaluate effectiveness. In conclusion, this study effectively demonstrated the value of non-grain attractants in maximizing wild pig visitations, while also identifying attractants which can minimize non-target visitations, within bottomland hardwood forests.

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