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Integrating Livestock into Cropping Systems Using Natural Biodegradable Repellents: Goats as Ruminant Models

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During this quarter two manuscripts have been prepared and are undergoing in-house peer review. The abstracts of the manuscripts are enclosed:

FEEDING RESPONSE OF ALPINE GOATS (*CAPRA HIRCUS*) TO CHEMICALS ISOLATED FROM LION FECAL SCENTS

ABSTRACT

Mature female Alpine goats were used in four 4 X 4 Latin square trials to screen 11 individual chemical scents isolated from lion feces. In all trials, an 11 cm diameter filter paper was impregnated with 1 ml of pure concentration scent. The shredded filter papers were placed on top of 500 g complete mixed feed and then introduced to the animals that had been fasted for 24 hours. Each goat was randomly offered one feed bucket at a time for three minutes, during which feed intake (FI) and number of head insertions (HI) were determined. The most effective scents in deterring feeding response were re-tested at 10% and then 3% concentrations using poly(ethylene glycol) as diluent in two separate 5 X 5 Latin square trials. Within each Latin square, animal response to a chemical was compared against the control. At 100% concentration, three of eight non sulfur-containing compounds (2-methyl-3-buten-2-ol, 2-methylhexanoic acid, and isobutyric acid or IBA) were found to significantly lower FI of goats with IBA being the most effective. At 10% concentration, however, IBA did not produce the same result. All three S-containing compounds significantly lowered FI of goats at 100 and 10% concentrations. Methyl disulfide (MD), 1-mercapto-2-propanol (MPO), and 3-mercapto-1,2-propanediol (MPE) at 10% concentration depressed FI by 46.4 g ($P < .004$), 50.2 g ($P < .003$), and 35.2 g ($P < .02$), respectively. The ratio FI/HI was depressed by the S-compounds at 10 and 100% concentrations. At 10% concentration, the depression was 98.1 g/HI ($P < .005$) with MD, 82.3 g/HI ($P < .02$) with MPE and 59.9 g/HI ($P < .06$) with MPO. At 3% concentration, neither MD, MPO, or MPE showed any deterring effect as measured by FI and HI; the FI/HI ratio was nevertheless found lower with MD (-47.3 g, $P < .04$) and MPO (-50.2 g, $P < .03$).

SYNTHETIC SEMIOCHEMICALS OF SMALL CARNIVORES DETER FEEDING OF GOATS

ABSTRACT

Ten mature female Alpine goats individually housed in crates were used in four Latin square trials to determine feeding response to six individual chemical scents isolated from the red fox urine and anal gland secretions of the stoat and the ferret. The chemicals were: Δ^3-Isopentenyl methyl sulfide (IPMS), 2,5-Dihydro-2,4,5-trimethylthiazole (TMT), 2-Propylthietane (PT), 3-Propyl-1,2-dithiolane (PDT), 2-2-dimethylthietane (DMT), and 3-3-dimethyl-1,2-dithiolane (DMD). The first 4 chemicals were tested at 10 and 3% concentrations whereas, only the lower concentration was applied to DMT and DMD. Poly(ethylene glycol) was used as an odor fixer to dilute the chemicals to desired concentrations. In all trials, an 11 cm diameter filter paper was impregnated with 1 ml of scent. The shredded filter papers were placed on top of 500 g complete mixed feed and then introduced to the animals that had been fasted for 24 hours. Each goat was randomly offered one feed bucket at a time for three minutes, during which feed intake (FI) and number of head insertions (HI) were determined. Within each Latin square, animal response to a chemical was compared against control. At 10% concentration, IPMS, PT, TMT, and PDT were found extremely effective in repelling goats through significant ($P < .0001$) depression of FI and FI/HI ratio. At 3% concentration, all chemicals except PDT, were found effective repellents. Feed intake was reduced by 66 g ($P > .05$), 65.5 g ($P < .004$), 87 g ($P < .0001$), 51.5 g ($P < .002$), 43.5 g ($P < .0001$), and 12.5 g ($P < .01$) with PDT, IPMS, PT, TMT, DMT, and DMD, respectively. The ratio of FI/HI was reduced by 114.2 g with PDT ($P > .05$), 68.3 g with IPMS ($P < .006$), 107 g with PT ($P < .0005$), 114 g with TMT ($P < .0004$), 75.1 g ($P < .03$) with DMT, and 28.7 g ($P > .05$) with DMD. In conclusion, semiochemicals of the red fox urine and anal gland secretions of the ferret and the stoat deterred feeding of goats under confinement on a short-term basis. Experimental data on responses of free-ranging goats are required before concrete conclusions relating to actual management conditions can be made.

Blood analysis for cortisol of both experiment has been completed and is being complied for statistical analysis. If the blood cortisol are significantly different between treatment then they will be incorporated into the two manuscripts before submitting to journals for acceptance and publication.