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Appendix 1

QUALITY SPECIFICATIONS FOR 1080 PELLET BAITS FOR POSSUM CONTROL IN NEW ZEALAND

Cinnamon-masked 1080 pellet baits

Efficacy: When 40 individually caged possums are presented paired trays containing 100 g of bait containing 0.15% 1080 and 100 g of non-toxic RS5 bait at least 90% of possums shall eat a lethal amount of toxic bait. To ensure most animals are killed quickly and humanely, it is recommended that a minimum of 35 of 40 caged possums eat at least 8 g of bait (i.e. the amount of bait that administers 4 mg/kg of 1080 to a 3-kg possum).

Baits

General: Baits shall be grain-based, regular in shape, poisoned with monofluoroacetate (1080), masked with cinnamon, and coloured green. The cereal grain for bait manufacture should contain no more than 13% moisture, and have less than 5% screenings. Before pelleting the grain shall be milled with a screen not exceeding 3 mm, so most particle sizes fall in a range from 0.25–0.50 mm. An approved biscuit grade of wheat is recommended for optimal binding of pellet ingredients. To prevent 'sweating' of recently manufactured cereal baits, they must be cooled to a temperature of no more than 8EC above ambient room temperature before they are packaged.

Palatability: The palatability of toxic bait should exceed 40% compared to recently manufactured non-toxic RS5 bait (of similar size).

Fracture/breakage/ dust and bait hardness: Dust and fragments (i.e. pieces less than 1 g) shall comprise no more than 5% by weight.

Size: Baits used during aerial control operations shall have a mean weight not less than 6 g. The standard deviation of 50 individually weighed baits should not exceed 1 g (one gram), with 95% of baits by weight weighing more than 4 g.

Hardness: A pointed 2-mm diameter probe shall penetrate baits when the mean pressure applied to the side-walls of 40 large (6 g) baits is 5–12 kg; or when 2–7 kg is applied with a pointed probe to the side-walls of 40 small (1.5 g) RS5 baits. The standard deviation of 40 baits shall not exceed ±5 kg pressure, with 95% of baits penetrated with 2–15 kg of pressure on the probe.

Toxin: The toxin, 1080, used in baits shall be at least 93% pure sodium monofluoroacetate and contain less than 0.25% inorganic fluoride. The pH of a 0.1% aqueous solution of the 1080 powder shall be 6.5 or less.

1080 concentration: The concentration of 1080 in samples of 10 baits shall be 1.5 ± 0.22 mg/g (i.e. all samples should have a concentration within 15% of the nominal concentration). The means of 10 or more such samples shall lie within ±5% of the nominal concentration. The concentration in 90% of 10 individual baits shall be within ±25% of the nominal concentration.

Colour: A green colour shall be incorporated into the bait to ensure it has a colour range of 221–267 by the New Zealand Standard Specification 7702 (section 23, Standards Act 1965). Surface colour shall be 98% or more of the surface area when tested by intercepts on a dot grid 1 cm × 1 cm over a random sample of not less than 100 baits.

Masks: Food grade cinnamon flavour (Bush, Boake and Allen, Auckland; Product No:02-7780) in monopropylene glycol with a specific gravity of 1.05 shall be mixed into baits at 0.2% wt/wt to mask the taste and odour of 0.15% 1080. Cinnamon concentrations should never be less than 0.1% or more than 0.5% wt/wt.

Stability: Baits shall be stored for no longer than 6 months with a moisture content of 12%, 3 months with a moisture content of 14%, and less than a month with a moisture content of 16%. Baits shall have a mould count less than 400 cfu/g . Bait should be stored in a cool, dry storeroom containing few micro- and macro-organisms.

Leaching: Baits shall retain 80% or more of their toxic loading after 5 mm of rainfall over 24 hours.

Storage and stacking of 1080 pellets

Bait shall be stored in a clean, dry, locked enclosure until it is used. Pallets of bait shall be stacked no more than two high during transport and storage.

Appendix 2

QUALITY SPECIFICATIONS FOR 1080 CARROT BAITS FOR POSSUM CONTROL IN NEW ZEALAND

Recommended specifications for carrot bait

Cinnamon-masked 1080 baits

Efficacy: When 40 individually caged possums are presented paired trays containing 100 g of bait containing 0.15% 1080 and 100 g of non-toxic RS5 bait, at least 90% of possums shall eat a lethal amount of toxic bait. To ensure most animals are killed quickly and humanely, it is recommended that a minimum of 35 of 40 caged possums eat at least 8 g of bait (i.e. the amount of bait that administers 4 mg/kg of 1080 to a 3-kg possum).

Baits

Specifications for carrot growers: Carrots supplied will be:

- Royal Chantenay
- Harvested at a time when 90% of carrots weigh 100–200 g
- Clean-pulled within 4 days prior to requested date of delivery of the consignment
- Topped
- Free of carrot worm, stem rot, woody pith, mould, bruising, weed and weed seed, stones, and other foreign objects
- Washed so that the consignment contains 99% carrot by weight.

On arrival at the airstrip carrots should be:

- Covered by tarpaulins if there is a risk of overnight frosts
- Stored for no longer than is absolutely necessary. If delays occur because of weather then the period of storage will depend on temperature and humidity, but should not exceed 1 month in ideal weather conditions (i.e., low humidity, cool temperatures)
- Free from signs of decay (heat, smell, or softness)

Palatability: The palatability of toxic bait should exceed 40% compared to recently manufactured non-toxic RS5 bait (6 g).

Bait size and chaff:

- Carrot baits shall have a mean weight of 6 g and 95% of baits by weight shall weigh between 3 and 10 g.
- Chaff (pieces of carrot less than 0.5 g) shall make up less than 1.5% by weight of useable bait.
- Chaff as a by-product will make up less than 40% by weight of the pre-processed carrot.

Toxin: The 1080 used in baits shall be at least 93% pure sodium monofluoroacetate and contain less than 0.25% inorganic fluoride. The pH of a 0.1% aqueous

solution of the 1080 powder shall be 6.5 or less. The 1080 stock solution will be 20% (±0.5%) sodium monofluoroacetate.

1080 concentration: Sodium monofluoroacetate will be surface-applied to carrot baits such that the concentration of 1080 in samples of 10 baits should be 1.5 ± 0.22 mg/g (i.e. all samples should have a concentration within 15% of the nominal concentration). The means of 10 or more such samples shall lie within ±5% of the nominal concentration. The concentration in 90% of 10 individual baits shall be within ±25% of the nominal concentration.

Colour: A green colour shall be incorporated into the bait to ensure it has a colour range of 221–267 by the New Zealand Standard Specification 7702 (Section 23, Standards Act 1965). Surface colour shall be 98% or more of the surface area when tested by intercepts on a dot grid of 1 cm × 1 cm over a random sample of not less than 100 baits.

Masks: Food-grade cinnamon flavour (Bush, Boake and Allen, Auckland; Product No: 02-7780) shall be used to mask 1080 by mixing it into baits at 0.3% wt/wt. The lure mixture shall be made by adding 3 litres of flavour concentrate to approximately 16 litres of soya bean or peanut oil, and applying 2 litres of this mix per tonne of cut bait. Alternatively, 300 mL of cinnamon lure should be mixed in 700 mL of monopropylene glycol, and added to the spray tank containing 1080 solution at the rate of one litre per tonne of carrot. Cinnamon concentrations following bait preparation should never be less than 0.1% or more than 0.4% wt/wt.

Stability: If, because of storage, uncut carrots start to become soft or ferment, the carrots should not be used for manufacture of baits. Carrot baits may remain palatable for a week after manufacture (i.e. palatability to 20 individually caged possums will be ≥40%). The 1080 concentration in a sample of stored carrot bait should be within ±15% of the nominal concentration.

Leaching: Detoxification of carrot is reliant on biodegradation of 1080 by micro-organisms as baits rot, therefore intact baits must be analysed for traces of 1080 before livestock are introduced back into control areas.

Approved essential oils and essences for use as masks with 1080 carrot bait

MASK	CONCENTRATION (v/w)	DESCRIPTION AND CODE NO.	
Cinnamon	0.1%	Cinnamon flavour	oil 02.7780
Orange*	0.125%	Firmenich product	52.596/T
Orange	0.5%	WJB orange	oil 78.0675
Aniseed	0.1%	Aniseed China Star	oil 72.2358
Plum	0.2%	Plum flavour	11.2114
Cherry	0.2%	Cherry flavour	2.1660
Lemon	0.5%	WJB lemon	oil 75.9794

Suppliers: Bush, Boake, and Allen (Auckland) except for Orange* from H.E. Terry (Auckland)

Appendix 3

POSSUM BAITS PER LETHAL DOSE (LD)

[1999 prices and details]

PRODUCT	BAIT SIZE	PACK SIZE	COST	NO. OF BAITS	BAITS PER LD
ACP No.7 1080 pellet bait	12 g	25 kg	$ 52.76	2080	1
ACP RS5 1080 pellet bait	6 g	25 kg	$ 44.23	4165	2
ACP PESTOFF Pro 1080 paste	8 g	20 kg	$117.23	2500	1
ACP Phosphorus D/S paste	8 g	20 kg	$129.95	2500	1
ACP Cyanide paste 55%	1 g	500 g	$ 24.50	500	1
ACP PESTOFF brodifacoum bait	2 g	10 kg	$ 35.00	5000	≥50
Feratox® encapsulated cyanide		1000	$450.00	1000	1
FeraCol® paste	20 g	4.5 kg	$180.00	225	1
Campaign® pellets	2 g	10 kg	$400.00	5000	8

Glossary of terms

abomasum	fourth stomach of a ruminant
ACT	activated coagulation time
albuminuria	kidney disease—raised albumin in urine
anaemia	low iron levels
anoxia	severe hypoxia—lack of oxygen to tissues
apnea	respiratory arrest
APTT	activated partial thromboplastin time
asystole	cardiac arrest
ataxia	loss of control of body movements
azotemia	increased blood urea nitrogen and creatinine
b.i.d.	twice a day
biodegradation	breakdown of chemical structure by biological process
biomagnification	accumulation of compound through increasing trophic levels
bradycardia	decreased heart rate
BUN	blood urea nitrogen
coagulopathy	blood clotting disorders
centrilobular necrosis	death of liver cells at the centre of the liver lobes
cyanosis/cyanotic	blueness of the skin and mucous membrane due to insufficient oxygen in the blood. May be peripheral due to poor circulation or central due to failure of oxygenation
cystine	amino acid found in plants, egg albumin, and keratin
cytotoxic	cell-poisoning
daphnia	water flea
defluorinate	to remove fluorine
dermal	skin
diaphoresis	perspiration
dyspnoea	difficulty breathing
dystonia	disordered muscle tone
ecchymoses	discolouration due to bleeding under the skin
ECG	electrocardiogram
EDTA	ethylenediaminetetraacetic acid
emetic	medicine that causes vomiting
EPA	Environmental Protection Agency
epistaxis	nose bleed
erythrocytes	red blood cells
fasciculation	muscle twitching involving contiguous groups of muscle fibres

glucosuria	raised glucose levels
glycolytic enzyme	an enzyme that breaks up the glycotic compound
haematemesis	vomiting blood
haematocrit	packed cell volume
haemoptysis	bleeding from the lungs
HCN	hydrogen cyanide
homeostasis	state equilibrium
hypercalcaemia	excess of calcium in the blood
hyperparathyroidism	disturbance of calcium metabolism
hypomagnesemia	deficiency of magnesium in the blood
hypervitaminosis	excessive intake of a vitamin
hypocalcaemia	deficiency of calcium in the blood
hyposthenuria	decreased urine specific gravity
hypovolemic	decrease in volume of circulatory blood
hypoxia	deficiency of oxygen in tissues
icteric	jaundiced
IM	intramuscular
intima	innermost lining of blood vessel
intraperitoneal	introduced into the peritoneal cavity
ipecac syrup	an emetic
INR	international normalised ratio
IU	international units
IV	intravenous(ly)
lacrimation	flow of tears [alternative spelling lachrymation]
lactate	ester of lactic acid
LD_{80}	lethal dose that kills 80% of the test organisms
LD_{50}	lethal dose that kills 50% of the test organisms
malaena	'tarry' faeces
mediastinum	membranous middle septum between the lungs
metabolites	the breakdown of compounds resulting from the metabolism of a parent compound
methaemoglobinemia	inactive form of haemoglobin present in blood
mucosa	a tissue layer found lining various tubular cavities of the body.
mydriasis	pupillary dilatation
nephrocalcinosis	deposits of calcium salts on the kidneys
NOEL	No observable effect level. A dosage of a toxicant that fails to produce any discernible signs of toxicosis, which may include a lack of morphological, biochemical, or physiological change
opisthotonus	spasm in which head and hind legs are bowed backwards

osteoclast	bone cell that has a function in dissolution of unwanted bone
paraesthesias	abnormal sensation caused by damage to peripheral nerves
parenteral	administered or occurring elsewhere in the body than in the alimentary canal
pathognomonic	specific, definitive pathological changes
peracute	very acute and violent
petechial	a small red spot cause by a minute haemorrhage into the skin
phosphocreatine	compound in muscles that release energy for muscle contraction
polar	water soluble
pollard	product milled from grain
polydipsia	increased water consumption
polyuria	increased urination
ppb	parts per billion (1 mg/kg)
proteinuria	protein in urine
prothrombin	blood clotting agent
PT	prothrombin time
recumbency	lying down
rhodamine	red dye
rodenticide	rodent poison
subendocardial	under the heart
subepicardial	under the serious membrane which covers the heart
tachycardia	rapid heart rate
tachyponea	rapid respiratory rate
thrombocytopenia	persistent decrease in number of blood platelets usually associated with haemorrhagic conditions
t.i.d.	three times a day
toxicosis	poisoning
toxin	a natural occurring poison, e.g. 1080, cyanide
toxicant	a synthetic man-made poison, e.g. brodifacoum
trans-dermal	through the skin
viscera	body organs