

The Effects of *MÛGÛKA* (*Catha edulis vahl*) on the Behaviour of Rats

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ABSTRACT

INTRODUCTION: *Mûgûka* (*Catha edulis vahl*) are 'residue' leaves, which are chewed to elicit a stimulant effect. It is grown in Eastern province (mostly in Mbeere and Embu districts) of Kenya and is very popular with the local residents in this part of the country. It is closely related to *miraa* (*Catha edulis forsk*), which is reported to be one of the most recklessly abused drugs in Kenya by NACADA (National Agency for the Campaign Against Drug Abuse). Whereas lots of research has been done on *miraa*, little, if any, research has been done on *mûgûka*.

OBJECTIVE: To determine the effects of *mûgûka* on the behaviour of Sprague Dawley rats.

MATERIALS AND METHODS: Five Sprague Dawley rats were used. The experiment was divided into three phases: Baseline, Normal saline and *Mûgûka*. Baseline phase established the normal behaviour of the rats before injection of *mûgûka* plant extract (*mûgûka* phase). Normal saline was used as a control. We conducted an Open field Test. The behaviours exhibited during a 30-minute trial were recorded for each of the experimental phases. The four behavioural parameters recorded for each experimental phase were line crossings, rearing counts, grooming time and defecation pellets count.

RESULTS: The behavioural changes noted after injection of *mûgûka* plant extract were; the **line crossing counts** increased but the grooming time, rearing counts and defecation pellet counts decreased. However, none of these changes was statistically significant. Sniffing behaviour was also markedly increased when the *mûgûka* was administered.

DISCUSSION: The results obtained above suggest that there are changes in the behavioural parameters although they are not statistically significant. The sample size probably needs to be increased and serial dose-response measurements for the injected *mûgûka* plant extract need to be done.

Keywords: *Mûgûka* (*Catha edulis vahl*), *miraa* (*Catha edulis forsk*), NACADA (National Agency for the Campaign Against Drug Abuse) in Kenya.

INTRODUCTION

Mûgûka (*Catha edulis vahl*) are 'residue' leaves, which are chewed to elicit a stimulant effect. It is grown in Eastern province of Kenya (mostly in Mbeere and Embu districts). It is very popular with the local residents in this part of the

country. *Mûgûka* is closely related to *miraa* (*Catha edulis forsk*). *Miraa* is also grown in Eastern Province of Kenya (mostly in Meru district) as well as Rift Valley Province of Kenya (Turkana and West Pokot districts). *Mûgûka* is reported to be one of the most recklessly abused drugs in Kenya by NACADA (the National Agency for the Campaign Against Drug Abuse). It has become a leading drug of abuse in Kenya, Somalia, Tanzania, other parts of Eastern Africa and Europe. However, some of these countries like Tanzania have however begun restricting its use. England is considering the imposition of a ban on importation of *mûgûka* and *miraa*.

In the early 1980s, some farmers transported the Meru type of *miraa* also called 'giza' (Kiswahili for darkness, because it makes the consumer's eyes dim) to Mbeere and Embu and managed to develop a mutant that proved to be highly resistant. This 'Embu miraa' came to be known as *mûgûka* and subsequently grew in popularity, not only Eastern province but also the rest of Kenya as well as other neighbouring countries.

Miraa was widely used in Kenya but *mûgûka*, which is a cheaper and a more potent alternative, has become more appealing and more preferred, according to NACADA. It is reported that a quantity of *mûgûka* costs one-tenth the price of a quantity of *miraa* that would yield the same level of intoxication. *Mûgûka* comes in easier to carry leaves as opposed to *miraa*'s cumbersome bundles of twigs. *Mûgûka* is also easier to consume since it is 'clean' as opposed to *miraa* where one has to keep on spitting out inedible bits which may accumulate in the mouth and may ooze from the sides of the mouth.

Mûgûka's potency is attributed to its leaves which contain a natural amphetamine that stimulates the Central Nervous System [CNS] when chewed. It is reported to equal opium in its intoxication potential. One news report quoted a consumer of the drug; "This thing is so cool, its maximum effect is more vicious than that of *miraa*, it carries you to another world."

The effects on the user are reportedly vicious with the user experiencing a constant 'high' manifested in the users' ability to walk for miles without fatigue. Weight loss, decreased sex drive and insomnia are other long-term effects that are also common.

OBJECTIVES

Broad objective:

To determine the effects of *mûgûka* on the behaviour of Sprague Dawley rats.

Specific objectives:

1. To determine the effects of *mûgûka* on the line crossing counts of Sprague Dawley rats.
2. To determine the effects of *mûgûka* on the rearing counts of Sprague Dawley rats.
3. To determine the effects of *mûgûka* on the grooming time count of Sprague Dawley rats.
4. To determine the effects of *mûgûka* on the defecation pellets count of Sprague Dawley rats.

MATERIALS AND METHODS

Subjects:

Five Sprague Dawley rats were housed in 30 x 12 x 12 cm plastic cages with wood-shavings for bedding and wire tops.

Drugs:

The rats received intraperitoneal injections of the *mûgûka* plant extract. Normal saline was used as control.

Procedure:

The experiment was divided into three phases: the baseline, the normal saline and the *mûgûka* plant extract. The baseline phase established the normal behaviour of the rats before injection of *mûgûka* plant extract (*mûgûka* phase). Normal saline was used as a control.

We conducted an **Open field Test**. The open field apparatus was made of plywood and measured 72 × 72 cm with 36cm high walls. The walls and floor were painted white. One of the walls was replaced with a clear Plexiglas for enhanced visualization. Black lines, drawn on the floor with a marker, divided the floor into 16 squares (18 × 18 cm). A central square of equal size (18 × 18 cm) was drawn in the middle of the maze.

At the beginning of each trial, a mouse was placed in the middle of the central square and the behaviours exhibited during a 30-minute trial were recorded. The four behaviours recorded were **line crossing counts**, **rearing counts**, **grooming time counts** and **defecation pellets count**. This was done for each of the three experimental phases.

The open field provides simultaneous measures of **spontaneous locomotion** (line crossing), **exploration** (rearing) and **fear or anxiety** (defecation). The experiment was conducted under daylight. The open field apparatus was cleaned with soap and water between each experimental trial.

RESULTS

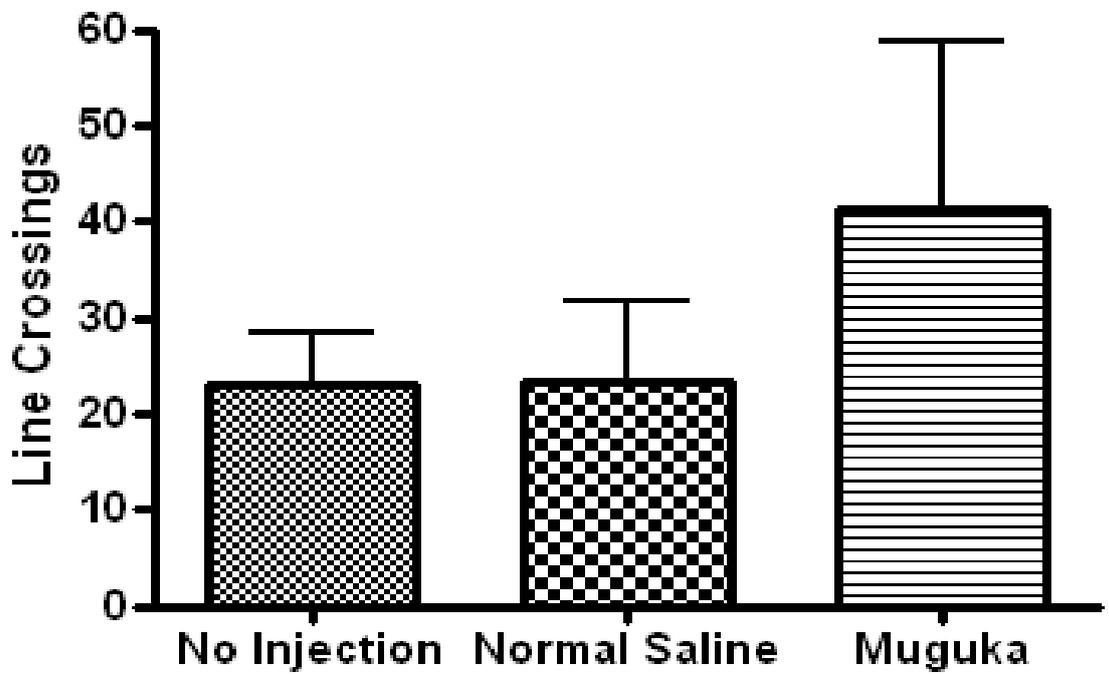
Table of results

	CAGE 1		CAGE 2		CAGE 3			
	<i>Unmarked Rat</i>	<i>Marked Rat</i>	<i>Unmarked Rat</i>	<i>Marked Rat</i>	<i>One Rat</i>			
BASELINE READINGS								
Date	<i>24-Aug-05</i>	<i>25-Aug-05</i>	<i>26-Aug-05</i>	<i>26-Aug-05</i>	<i>23-Aug-05</i>	AVG*	STD.DEV*	SEM*
Line crossings	31	19	4	33	28	23	11.90	5.32
Grooming time (sec)	299	319	45	363	254	256	124.29	55.58
Rearings	10	6	2	17	11	9.2	5.63	2.52
Defaecation Pellets	2	7	4	2	10	5	3.46	1.55
NORMAL SALINE READINGS								
Date	<i>30-Aug-05</i>	<i>30-Aug-05</i>	<i>06-Sep-05</i>	<i>31-Aug-05</i>	<i>31-Aug-05</i>	AVG*	STD.DEV*	SEM*
Line crossings	16	34	3	50	14	23.4	18.57	8.30
Grooming time (sec)	84	394	134	181	327	224	131.39	58.76
Rearings	2	11	1	14	2	6	6.04	2.70
Defaecation Pellets	5	0	2	0	1	1.6	2.07	0.93
MÛGÛKA (Catha edulis vahl) READINGS								
Date	<i>01-Sep-05</i>	<i>01-Sep-05</i>	<i>08-Sep-05</i>	<i>02-Sep-05</i>	<i>02-Sep-05</i>	AVG*	STD.DEV*	SEM*
Line crossings	22	59	5	20	101	41.4	38.80	17.35
Grooming time (sec)	53	91	2	172	109	85.4	63.43	28.37
Rearings	2	12	0	4	7	5	4.69	2.10
Defaecation Pellets	2	0	2	1	2	1.4	0.89	0.40
AVG*=Average STD. DEV*=Standard Deviation SEM*=Standard error of the mean								

Graphs

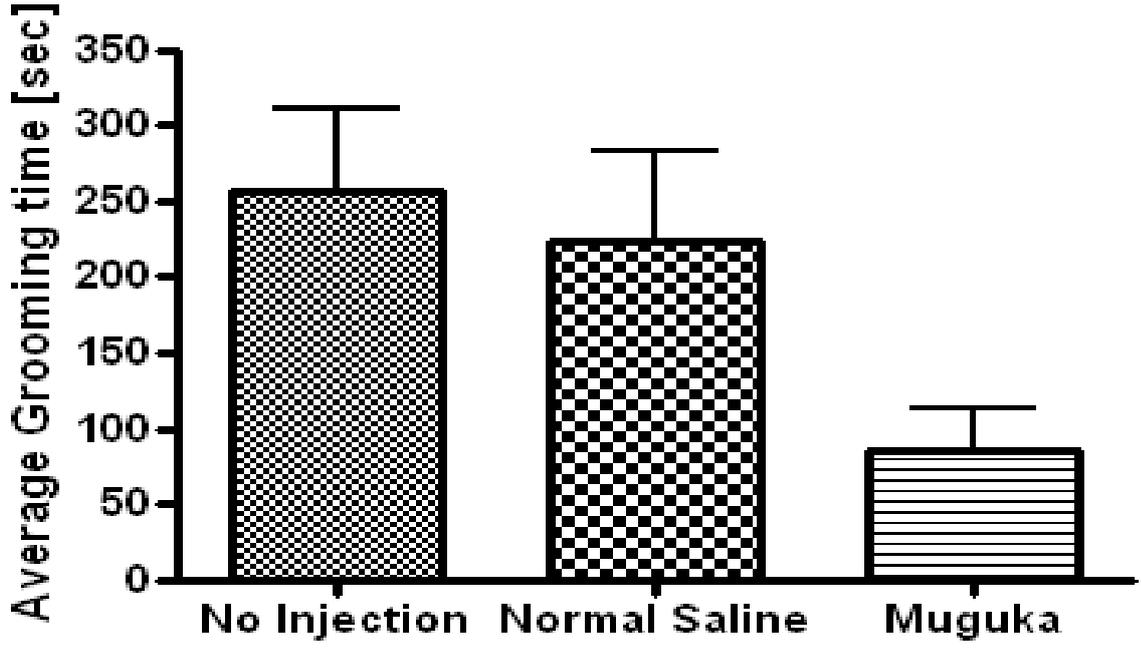
GRAPH 1

Average Line Crossings



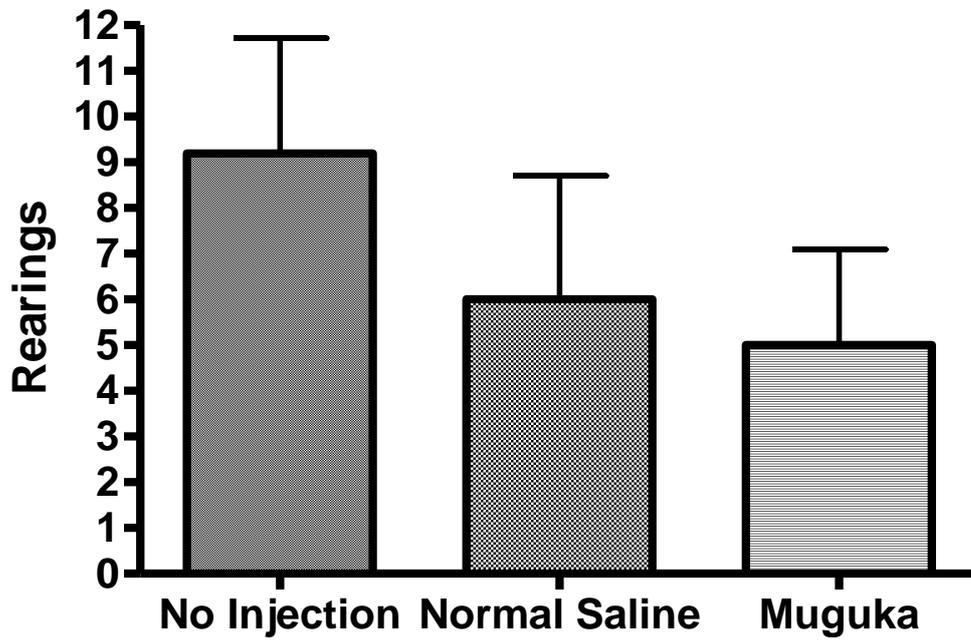
GRAPH 2

Average Grooming time



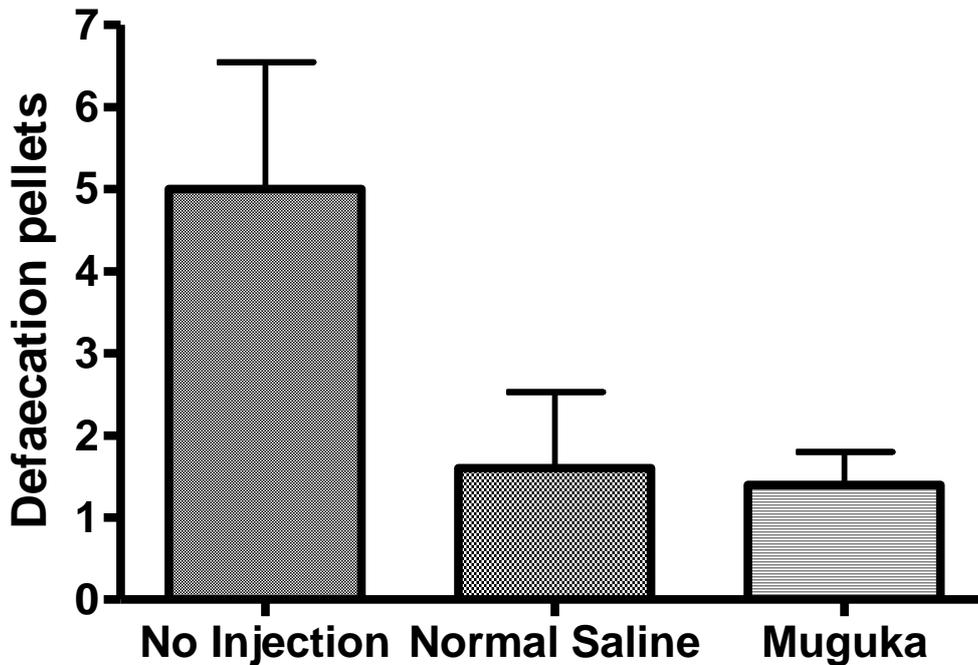
GRAPH 3

Average Rearings



GRAPH 4

Average Defaecation pellets



Summary of results

The behavioural changes noted after injection of *mûgûka* plant extract were; the line crossing counts increased (graph 1); the grooming time count decreased (graph 2), rearing counts decreased (graph 3) and defecation pellet counts reduced (graph 4). Sniffing behaviour was also markedly increased when the *mûgûka* was administered.

However, none of these changes was statistically significant.

DISCUSSION

The results obtained above suggest that there are changes in the behavioural parameters although they are not statistically significant. The sample size probably needs to be increased and serial dose-response measurements for the injected *mûgûka* plant extract need to be done.

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