

Laboratory studies on preference of short-tailed mole rat, *Nesokia indica*, for some commercial varieties of sugarcane

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ABSTRACT

Laboratory studies were conducted to explore the potential of preference of short-tailed mole rats (*Nesokia indica*) for the four commercial varieties of sugarcane, namely; BL-4, Gulabi-95, Triton and Thatta-10. Results revealed that BL-4 was the most preferred variety. Sugarcane consumption was 56.69 ± 2.62 g as compared to rice consumption 23.09 ± 4.03 g/kg body weight by male rats; whereas sugarcane consumption was 72.52 ± 4.00 g as compared to rice consumption 20.47 ± 2.49 g/kg body weight by female rats. Thatta-10 was found the least preferred variety by showing sugarcane consumption as 25.83 ± 1.00 g as compared to rice consumption 28.19 ± 1.81 g/kg body weight by male rats; whereas sugarcane consumption was 29.13 ± 3.04 g as compared to rice consumption 28.19 ± 1.50 g/kg body weight by female rats. For the variety Triton, sugarcane consumption was 36.03 ± 0.3 g as compared to rice consumption 11.59 ± 1.02 g/kg body weight by male rats; whereas sugarcane consumption was 43.78 ± 4.57 g as compared to rice consumption 25.85 ± 2.24 g/kg body weight by female rats. For the variety Gulabi-95, sugarcane consumption was 46.08 ± 2.12 g as compared to rice consumption 18.06 ± 1.68 g/kg body weight by male rats; whereas sugarcane consumption was 42.60 ± 0.92 g as compared to rice consumption 16.45 ± 1.86 g/kg body weight by female rats.

INTRODUCTION

Sugarcane (*Saccharum officinarum*) is a widespread crop, growing best in the zone between tropics and sub-tropics. Next to cotton, sugarcane is Pakistan's most important cash crop. It is grown primarily in the making of sugar and sugar-related products. Sugarcane also produces

essential items for industries, like chipboard, paper etc. Sugarcane has around 3.1% value added share in agriculture with 0.6% in GDP. It was cultivated on an area of 1,141,000 hectares during 2014-15 (against last year's area of 1,173,000 hectares) showing a decrease of 2.7%, producing 62.7 million tons of sugarcane (against 67.5 million tons last year) showing a decrease of 7.1% (Pakistan Economic Survey 2014-15). Sugar export raised foreign exchange of US\$ 171.78 million. Sugarcane is a profitable crop for growers as long as growing problems do not overtake the fields. One of the major problems is invasion of the rodent pests. Sugarcane is a long duration crop and thus provides an ideal condition for a complex of rodent population to subsist and cause extensive damage through eating into internodes and roots resulting infestation with microorganisms, causing the susceptibility for diseases, insect deterioration, and reduction of weight and sugar recovery. The damage becomes more prominent in lodged sugarcane. Sugarcane crop is heavily damaged by a complex of rodent species including *Nesokia indica*, *Bandicota bengalensis*, *Millardia melitana* and *Mus booduga* (Hussain *et al*, 1975; Smiet *et al*, 1978, 1980; Beg *et al*, 1979 & 1980; Khan, 1982; Hampson, 1984; Roberts, 1997; Mishkat *et al*, 2006). Economic losses by rodents to sugarcane in Pakistan are documented by some scientists, such as Beg *et al* (1979) described 11% damage to sugarcane in three districts of central Punjab. Fulk *et al* (1980) assessed 7.2 and 4.4% damaged canes and reduced sugar production by an average of 10.7% and 7.7% in four districts of Punjab and Sindh during 1978 and 1979, respectively. Mishkat *et al* (2006) estimated 10.77% reduction in sugar recovery because of rat damage in sugarcane growing areas of Mandi Bahauddin, Phalia, Balwal and Khushab. Smiet *et al* (1980) estimated 24% damage to canes in Thatta district of lower Sindh. Khan (1990) calculated economic losses of Rs.140.6 million annually based on 1986-87 production and support prices. He recommended the usage of 0.005% brodifacoum wax blocks (Klerat) to many workers in cane fields. In a rat damage survey by Fulk *et al*, 1980 at Fauji Sugar Mill, Khoski, Badin, 10.7% loss to sugar production was recorded. In another study conducted in sugarcane growing areas of Army Welfare Sugar Mills, Badin district, 2% Zinc Phosphide baiting decreased 74% rodent population (Khan & Munir, 2006). Many scientists of Vertebrate Pest Control Institute conducted extensive surveys, laboratory and field trials related to rodent management and developed models, packages for the growers (Smythe, 1977; Khan, 1977; Smythe & Khan, 1980; Fulk *et al*, 1978 & 1980; Smiet *et al*, 1980; Shafi & Khan, 1983; Brooks *et al*, 1989; Khokhar & Rizvi, 1999; Pervez *et al*, 1999 & 2005; Tariq *et al*, 2009).

MATERIAL AND METHODS

Laboratory studies were carried out to know the preference for sugarcane by the rats as well as the difference of sugarcane consumption among the four commercial varieties of sugarcane, namely, BL-4, Gulabi-95, Triton and Thatta-10 (Figure-1 to Figure-5). Short-tailed mole rats, *Nesokia indica*, were collected through digging of burrows found in sugarcane fields in Thatta district, lower Sindh, Pakistan. Twenty rats (ten male and ten female) were sexed, weighed and caged individually for acclimation in laboratory for 15 days and were fed on poultry feed during acclimation period and between the trials. Water was provided *ad libitum*. All the four varieties of sugarcane were harvested freshly from National Sugar and Tropical Horticulture Research Institute, Pakistan Agricultural Research Council, Thatta, lower Sindh. Stalk sections were cut from the bottom of mature canes and the pre-weighed sections of all four varieties (individually) of sugarcane stalk were kept in all cages of the rats. Twenty gram of rice were provided to each rat as an alternative food source occurring naturally (Martin *et al*, 2007). Trials were carried out in animal rooms, away from human activity and rats were kept visually isolated from each other. All the sugar cane stalks and the left over rice were weighed again after 24 hours. The sugarcane and rice consumption by each rat was recorded for five consecutive days. Statistical analysis of the data was carried out to compare intake of sugarcane among the four varieties by the rats. Comparison of sugarcane and rice intake (g/kg body weight.) was carried out to know the preference.

RESULTS AND DISCUSSION

Short-tailed mole rat, *Nesokia indica*, inflicts significant damage to sugarcane crop; however, the damage inflicted to different varieties of sugarcane by the specie is unknown. The feeding trial experiment was carried out to know the difference in the grams of sugarcane consumed for the four commercial varieties of sugarcane, namely, Gulabi-95, Triton, BL-4 and Thatta-10 by the specie. The sugarcane and rice consumption by each rat was recorded for five days. As per results, BL-4 was found the most preferred variety. Sugarcane consumption was 56.69 ± 2.62 g as compared to rice consumption 23.09 ± 4.03 g/kg body weight by male rats; whereas sugarcane consumption was 72.52 ± 4.00 g as compared to rice consumption

20.47±2.49 g/kg body weight by female rats. The variety may be preferred due to its softness and high sucrose contents. Thatta-10 was found the least preferred variety by showing sugarcane consumption as 25.83±1.00g as compared to rice consumption 28.19±1.81 g/kg body weight by male rats; whereas sugarcane consumption was 29.13±3.04g as compared to rice consumption 28.19±1.50 g/kg body weight by female rats. For the variety Triton, sugarcane consumption was 36.03±03g as compared to rice consumption 11.59±1.02 g/kg body weight by male rats; whereas sugarcane consumption was 43.78±4.57g as compared to rice consumption 25.85±2.24 g/kg body weight by female rats. For the variety Gulabi-95, sugarcane consumption was 46.08±2.12g as compared to rice consumption 18.06±1.68 g/kg body weight by male rats; whereas sugarcane consumption was 42.60±0.92g as compared to rice consumption 16.45±1.86 g/kg body weight by female rats (Table-1, Graph-1 & Graph-2). Overall sugarcane was preferred for all the varieties except Thatta-10 as compared to rice. Thatta-10 proved it the best variety in the contest; although it has the highest sucrose contents (Keerio *et al*, 2003). However, due to its hardness and thickness it was not preferred by the rats. These results are in line with previous findings by Tariq *et al* (2009).

RECOMMENDATIONS

Sugarcane is a long duration crop and thus provides an ideal condition for a complex of rodent population to subsist and cause extensive damage to the sugarcane, standing or lodged. The rodent control often performed is insufficient, in response to high rodent populations, poorly timed or is after the damage has been done. The growers need a better understanding of the rodent damage as per the variety, rodent species identification and its biology in relation to crop timings. A cost-benefit analysis should be conducted for rodent management. An Integrated Pest Management approach is being practiced to manage rodent's damage in sugarcane crop by Vertebrate Pest Control Institute, Southern-zone Agricultural Research Centre, Pakistan Agricultural Research Council. The package is successfully developed for rodent management after a series of trails and is now ready for adoption by the end-users.

REFERENCES

- Beg, M. A., Khan, A. A. and Begum, F. (1979). Rodent problem in sugarcane fields of central Punjab, *Pak. J. Agric. Sci.* 16 (1-2): 123-129.
- Fulk, G. W., Salam, S. A. and Akhtar, M. T. (1980). Rat damage to sugarcane in Pakistan. *Pak. J. Agric. Res.* 1 (2): 131-134.
- Hampson, S. J. (1984). A review of rodent damage to sugarcane with criteria for the use of rodenticides. *In. Proc. Conf. Org and Prac. Vert. Pest Control*, Hampshire, UK: 1-18
- Keerio, H. K., Panhwar, R. N., Memon, Y. M., Araiien, M. Y., Chohan, M. K. and Qazi, B. R. (2003). Qualitative and quantitative performance of some promising and commercial sugarcane varieties under agro-climatic conditions of Thatta. *Pak. J. Applied Sci.*, 3 (10-12): 670-673.
- Khan, A. A. and Munir, S. (2006). Effect of zinc phosphide bait on rodent abundance in sugarcane field. *Proc. of 41st Annual Convention. Pak. Soc. of Sugar Technol.*: 206-213.
- Khan, A. A. (1977). Development of sugarcane rat control programme by Fauji Foundation Sugar Mills. *Proc. 14th Convention. Pak. Soc. of Sugar Technol.*: 108-115.
- Khochar, A. R. and Rizivi, S. W. A. (1999). Vertebrate pest problems in Sindh and their impact on agricultural economy. *Pakistan Food and Agriculture Review*: 7-8.
- Martin, J., M., Raid, R., N. and Branch, L C. (2007). Quantifying damage potential of three rodent species on sugarcane. *Journal American Society of Sugarcane Technologists*, 27: 48-54.
- Mishkat, U., Butt, B. U. and Shah, M. (2006). Assessment of cane and internode damage in mill-able cane by sugarcane pest complex. *Sarhad J. Agric.* 22 (2): 279-302.
- Pakistan Economic Survey (2014-15). Economic Advisor's Wing, Finance Division. Ministry of Finance. Government of Pakistan, Islamabad.
- Pervez, A., Ahmed, S. M., Ahmed, S. and Rizvi, S. W. A. (1999). The significance of additive to enhance poison bait acceptance against rodents damaging paddy in lower Sindh, Pakistan. *Pak. J. Zool.* 37 (3): 207-210.

- Pervez, A., Ahmed, S. M., Ahmed, S. and Rizvi, S. W. A. (2005). Comparative field efficiency of some additive formulated baits against rodent pests of wheat crop in Sindh, Pakistan. *Pak. J. Zool.* 37 (4): 269-274.
- Pervez, A., Ahmed, S. M. and Rizvi, S., W., A. (1998). Comparative efficacy of Bromadiolone, Cholecalciferol and Zinc Phosphide against short-tailed mole rat, *Nesokia indica* in captivity. *Turkish. J. of Zoology*, 22: 137-140.
- Roberts, T. J. (1997). *The Mammals of Pakistan*. Oxford Uni. Press. pp. 361.
- Shafi, M. M. and Khan, A. A. (1983). Rats damage to sugarcane crop and its control. *Progressive Farming* 3 (1): 18-22.
- Smiet, A. C., Fulk, G. W. and Lathiya, S. B. (1980). Rodent ecology in sugarcane in lower Sindh, Pakistan. *Acta Theiol.* 25 (8): 81-97.
- Smythe, W. R. (1977). Sugarcane rats of Pakistan and their control. *Int. Proc: 14th Pak. Soc. Cong. Karachi*: 102-107.
- Smythe, W. R. and Khan, A. A. (1980). An effective zinc phosphide bait for field rodents. *Pest Control*, 48 (28): 30- 32.
- Tariq, S. A., Pervez, A. & Ahmad, S. M. (2009). Development of rodent and wild boar pest management models for sugarcane crop, *Proceedings of 44th Annual Convention Pak. Soc. of Sugar Technol.*: 149-154.

Figure-1: Sections of sugarcane variety BL-4



Figure-2: Sections of sugarcane variety Gulabi-95



Figure-3: Sections of sugarcane variety Triton



Figure-4: Sections of sugarcane variety Thatta-10



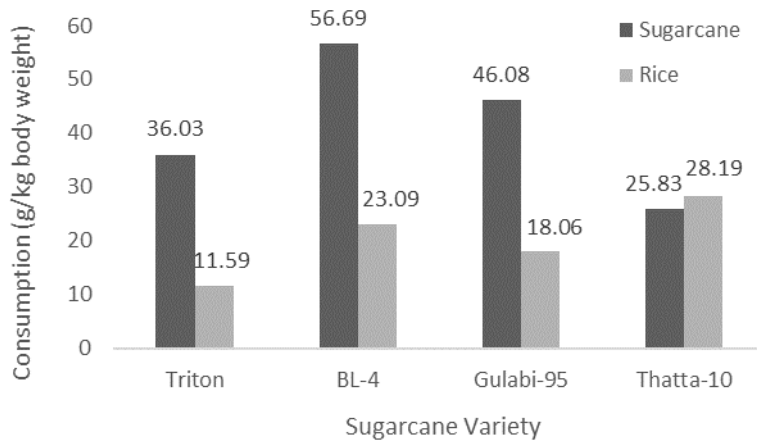
Figure-5: Laboratory trials on feeding preference of *Nesokia indica*



Table-1: Consumption (g/kg body weight) of Sugarcane and Rice by short-tailed mole rat, *Nesokia indica*

Sugarcane Variety	Male Rat			Female Rat		
	Weight	Sugarcane	Rice	Weight	Sugarcane	Rice
Triton	154.30 ±15.93	36.03±03	11.59±1.02	113.39 ± 5.61	43.78±4.57	25.85±2.24
BL-4	130.22 ±5.60	56.69±2.62	23.09±4.03	118.73 ±7.20	72.52±4.00	20.47±2.49
Gulabi-95	147.23 ±5.36	46.08±2.12	18.06±1.68	123.03 ±6.86	42.60±0.92	16.45±1.86
Thatta-10	134.98 ±5.48	25.83±1.00	28.19±1.81	115.52 ±5.81	29.13±3.04	28.19±1.50

Graph-1: Preference for sugarcane and rice by male short-tailed mole rat, *Nesokia indica*



Graph-2: Preference for sugarcane and rice by female short-tailed mole rat, *Nesokia indica*

