

Pesticide contaminated crop residues and water usage for dairy cattle rearing in Walapane DS division, Sri Lanka

K.P.S.R. Pathirana, K.G.S.C. Katukurunda, R.A.D.I. Dilhani, R.A.U.J. Marapana, J.M.J.K. Jayasinghe, S.B. Navaratne

Department of Food Science and Technology, Faculty of Applied Sciences, University of Sri Jayawardenepura, Gangodawila, Nugegoda, Sri Lanka

Abstract—Contamination of milk with pesticide residues is a matter of serious concern. The extensive use of pesticides may lead to environmental and food contamination also risk of contamination was occurred especially in up country because of scarcity of grazing lands. Abundance of crop residues in substantial amounts lead farmers to feed them adequately for cattle. Farmers who cultivate upcountry vegetables tend to apply higher amounts of pesticides due to the intensive cultivation of hybrid crop varieties and highly favorable weather conditions for the rapid spread of pests and diseases. The objectives of this study were to identify the types of pesticides used in the area, crop residues that are used as feed material and sources of contaminants which have an impact to the milk industry in Walapane. Primary data for the study were collected from thirty farmers randomly (n=30) representing three villages of Walapane DS division namely Ragala, Nildandahinna and Wewekelle. Major vegetables in the area were cabbage, tomato, beans, eggplant and carrot. Majority (64%) of milk farmers had Jersey crosses, while 36% had Friesian crosses. Most (53%) farmers carry out extensive rearing in roadsides and vegetable lands and intensive rearing of 47%. Farmers (84%) provide grasses and crop residues (16%) to cattle. Fresh grasses and crop residues were directly fed to cattle without any treatments. Farmers used well water (93%) and natural water stream (7%) as water sources. The majority (>90%) disposed the empty pesticide containers by throwing in the crop land and water sources itself. Farmers applied Mancozeb (47%), Propineb (37%), Fipronil (10%) and Maneb (6%) as pesticides for cultivation of vegetables nearby water sources while fungicides (Propineb 36% and Mancozeb 20%) applied nearby farm lands. Feeding with crop residues, grasses and water which were contaminated with pesticides encountered high risk to contain pesticide residues in milk in Walapane DS Division Sri Lanka.

Index Terms—Milk, Pesticides, Feed, Water, Walapane

I. INTRODUCTION

Sri Lanka, the pearl of the Indian Ocean is an island of 65, 525 sq. km and home to 20.1 million people. The land area under agriculture in Sri Lanka is around 2 million hectares, which is 30% of the country's total area of 65,610 sq. km. Almost 75% of the agricultural land is under small-holdings, and the total number of such holdings is less than 2 ha. Almost one third of these small-holdings have a mixture of crops and livestock. The total number of farmers involved in livestock production is estimated at 700,000, and between 30-60% of gross farm income is generated from livestock activities (3).

Milk is considered as one of the convenient food stuffs. Around 36.6% and 19.9% of milk collected in the country are from the Central Province and the North-Western Province, respectively (2). As a whole, Nuwara Eliya District in hill country gives the highest milk production.

Milk-producing animals, such as cows, accumulate residues of these insecticides when they eat contaminated feed, water and by inhaling contaminated air. Owing to their lipophilic properties, pesticides are initially stored in fat-rich tissues and subsequently are translocate and excreted with endogenous fat through the milk. Therefore, consumption of these fat-rich dairy products exposes organisms to unexpected residual levels of pesticides. Pesticides contamination which occurred in farms, grazing areas and water sources were estimated and quantitative estimation of identified pesticides residues in raw milk samples was done in Magastota area, Nuwara Eliya. Mancozeb, Propineb, Glyphosate, Chlorothalonil, Maneb, Chloropyrifos and Tebuconazole were recognized as major

pesticides contaminants in the area. Feeding of contaminated crop residues and pasture and providing of contaminated water was recognized as the sources of contamination by field survey (1).

According to this situation, the milk production faced a conflict accompanied by pesticide residues. Recent research undertaken in Nuwara Eliya district does identify important links between milk and milk product and pesticide residues (Chaminda et al, 2012). Therefore the present study will be carried out to investigate the pesticide residues in milk and milk products in Walapane DS division.

II. METHODOLOGY

There are five Divisional Secretariat Divisions (DSDs) as Ambagamuwa, Hanguranketha, Kothmale, Nuwara Eliya and Walapane in Nuwara Eliya district. Walapane DS division was selected for the survey. Total number of villages in Walapane DS division were determined. Thereafter sample size (milk farmers) were determined with respect total number of villages in Nuwara Eliya District by using ISO 2859-1 1989 (E) sampling plan. Sample size were stratified according to the number of villages in a segment (DS Divisions) in order to detect sample size of each segment. The present study was conducted in Walapane DS division. The selected villages were Ragala, Nildandahinna and Wewakelle.

Data collection

Randomly selected thirty milk farmers (n=30) were interviewed. A field survey using a pre tested questionnaire were carried out to identify the types of crops, farm management practices and sources of contaminations which have an impact to the milk industry of the area. Since milk can be contaminated with different kind of feeding sources, identification of these sources. Data were collected through face to face interviewing of farmers. Therefore, pretested questionnaire were used to identify the sources of contamination.

III. RESULTS AND DISCUSSION

All the selected 30 farmers in Walapane DS division use crossbred animals for milk production. The mild climate of the region facilitates the milk production of them. The pure bred animals can be reared in this climate but rural farmers tend to cross their animals for the ease of management. These crossing

procedures were maintained through the Department of Animal Production and Health by intensive record keeping to prevent inbreeding. Majority of 64% of farmers have Jessy crosses and 36% Friesian crosses. Major crops in the area were vegetables (cabbage, tomato, beans, eggplant and carrot). All the farms were surrounded by vegetable cultivations. Though the survey was conducted at Maha season, it was recognized that the whole Walapane DS division has no seasonal variation for vegetable cultivation. Throughout the year cultivation take in place depending on the climate. Most farmers, actually a 53%, carry out extensive rearing in their gardens, roadsides and vegetable lands rather than intensive rearing 47%. Considering about the other management practices, regular cleaning of animals done before milking and water (tap water and well) is provided.

When considering about Walapane area, feeding of crop residues and providing of contaminated fountain water was recognized as the major causes for contamination via the survey. Farmers provide grasses, poonac, fodder, rice bran and crop residues (carrot and cabbage leaves), it was provided freshly with the contaminants. No treatments done to remove the contaminants even washing.

Farmers (84%) provide grasses and crop residues (16%) to cattle. Cabbage and leeks were causing loose motion condition to animals. Fresh grasses and crop residues were directly fed to cattle without any treatments.

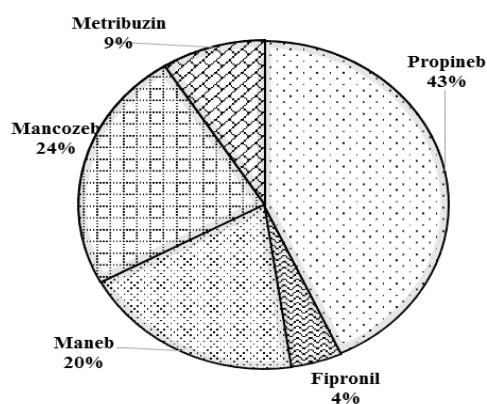


Fig 1: Pesticides apply for surrounding crop lands

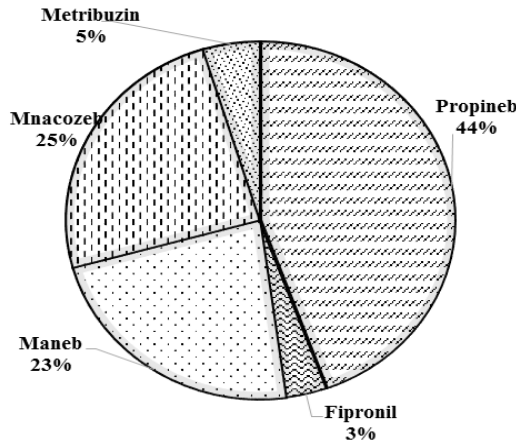


Fig 2: Pesticides apply for surrounding crop lands near extensive grazing places

Survey results revealed that the pesticides were mainly sprayed of aerosols (100%). A per the topography of the area the applied pesticides were washed away to nearby lake and the pasture lands. As mentioned above the farmers do extensive and semi intensive rearing of animals in roadside, near vegetable lands and gardens. Also farmers who rear their animals intensively practice cut and fed system for grass from those areas. Mancozeb, Propineb, Fipronil, Maneb and Metribuzin were recognized as major pesticide contaminants in the area. Pesticides were applied heavily because of the moist environment and elevated pest and disease problems. The analysis of other agrochemicals wasn't done because of practical problems in determination.

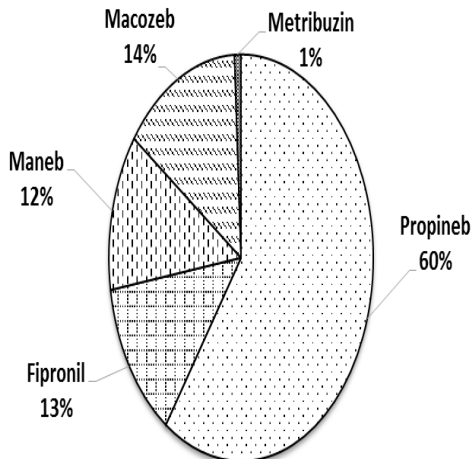


Fig 3: Pesticides apply for lands nearby natural water sources

Figure: 1 shows the pesticides which sprayed near selected dairy farms at Walapane DS division. Most frequently used pesticides were Propineb (43%), Mancozeb (24%) and Maneb (20%). The humidity and fog enhances the fungal attacks to vegetable crops and frequent use of fungicides as Maneb and Propineb can be justified. During the land preparation weedcides were used once or twice for the crop lands. Weedicide usage depends on the vegetable type and the nature of the land.

Pesticides applied for surrounding crop lands near extensive rearing areas were shown in Fig: 2. Use of Propineb (44%), Mancozeb (25%) and Maneb (23%) was seen heavily within these places. The dominance of fungicides were seen more than 50%. Survey results also revealed that most of the time farmers apply pesticides more than five or six times per a season for a particular crop. Farmers tend to use multi types of chemicals and over dosages to overcome this problem. Agrochemical abusing, over dosing, not adherence of statutory & regulatory requirements, neglecting of the opinions of the knowledgeable persons and regardless of personal safety was identified as major issues regarding the pesticide use. Hand sprays or power sprays were used to apply the chemicals and selection of the sprayers was depend on the land extend, maturity of the vegetables and climate. Disposal of empty pesticide containers to water streams (85%) was seen other than burying (15%) and burning (5%).

Pesticides apply for nearby natural water sources were shown in Fig 3. Propineb (60%), Mancozeb (14%), Maneb (12%) and Fipronil (13%) were the frequently used pesticide types. The probability of drinking water pollution via these pesticides were heavily observed. Fountain water acted as a carrier of pesticides to nearby lakes and grass lands which lead to contamination of extensive grazing areas of cattle.

IV. CONCLUSION

In this study the identification and confirmation of agrochemical contamination which occurred in farms, grazing areas and water sources in Nildandahinna, Ragala and Wewakelle. Mancozeb, Propineb, Fipronil, Maneb, Metribuzin were recognized as major agrochemical contaminants in the area. Feeding of contaminated crop residues and pasture and providing of contaminated water was recognized as the sources of contamination by the

field survey. The milk which produced in Walapane DS division is safe to consume but supplementary investigations should be done within this subject in future because of other unidentified agrochemicals.

V. ACKNOWLEDGEMENT

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REFERENCES

(Periodical style)

- [1] Chaminda, K.G.S., Marapana, R.A.U.J. and Serasinhe, R.T., (2013), Awareness and adoption of farmers to golden rules of pesticide usage in Magastota, Nuwara Eliya Sri Lanka, Proceedings of the 69th annual sessions of Sri Lanka Association for the Advancement of Science, 2-6 Dec 2013 Part I.
- [2] Department of Animal Production and Health, Sri Lanka. (2011). Sri Lanka Livestock Statistics 2011.
- [3] Sangakkara U.R. and Nissanka S.P. (2007), Food security in Sri Lanka-agronomic implication and potentials. Journal of National Science Foundation. Sri Lanka 2007 36 Special Issue. pp 17-24.