Pesticide use and risk exposure in Congolese vegetable farming

A case study of Brassica growers around Goma city

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BACKGROUND

- *Brassica* crops (Brassicaceae) are among the most important vegetables grown in eastern Democratic Republic of Congo.
- Cabbage and cauliflower are the most grown cultivars in the region, while broccoli and Chinese cabbage are less common.
- To manage pest threats, farmers mainly resort to broad-spectrum insecticides despite the environmental and health adverse effects they cause [1].

OBJECTIVE

To investigate pesticide use, farmers' attitudes, and safety in small-scale vegetable fields around Goma, the capital city of North-Kivu Province in Eastern Democratic Republic of Congo.

METHODS

SURVEY

KoboToolbox

430 *Brassica* growers interviewed on their farms in 2023 and 2024.

- Open- and closed-ended questions were administered face-to-face to ensure the farmers' understanding.
- Empty bottles of chemical insecticides were checked to confirm the active ingredients and their concentration.

Figure 1. Interviewing *Brassica* growers about the use of insecticides in the survey areas.

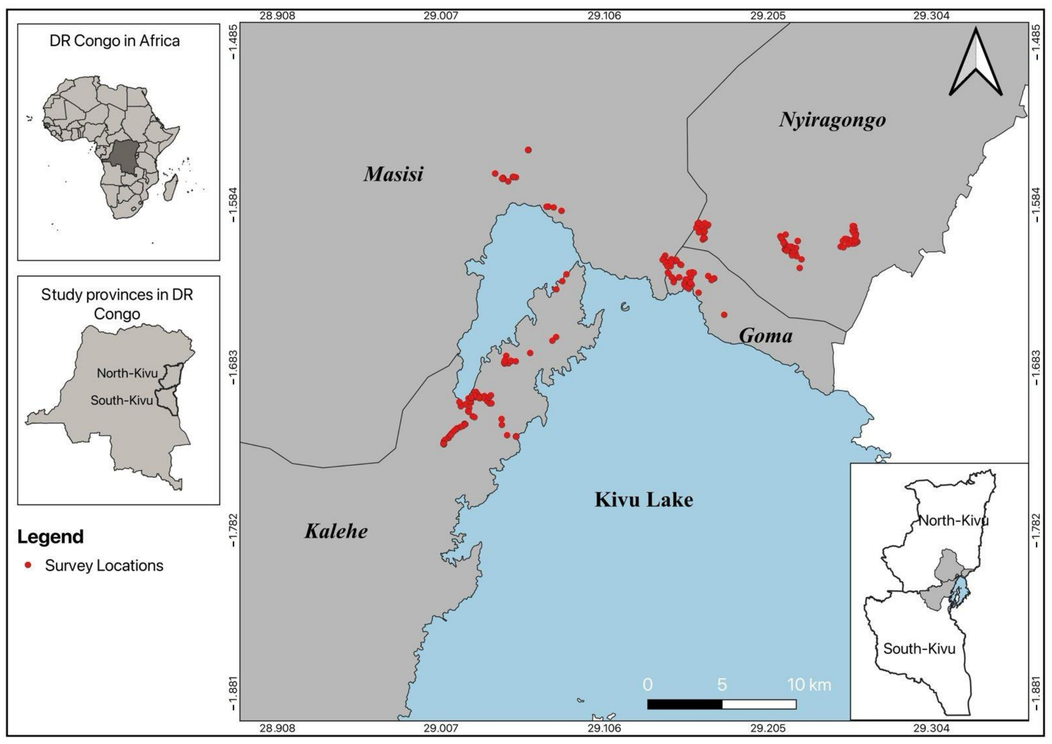

Figure 2. Map showing the survey locations (red dots) in the North-Kivu and South-Kivu provinces, eastern Democratic Republic of Congo.
Generated in QGIS 3.34 based on GPS coordinates collected with KoboCollet Application.

RESULTS

Table 1. Farmers' safety and attitudes when using insecticides

Variables	Categories	Survey Areas: Goma n = 71	Nyiragongo n = 145	Masisi n = 30	Kalehe n = 184	Overall n = 430	χ^2 Test
Wear PPE (%)	Yes	39.4	35.2	36.7	45.1	41.9	3.54 ns
	No	60.6	64.8	63.3	54.9	58.1	
Type of PPE used (%)	Face mask	19.1	24.7	13.3	16.2	19.5	19.38 ns
	Long clothes	25.7	17.2	24.4	24.8	22.3	
	Rubber boots	40.4	44.6	51.1	49.2	46.1	
	Gloves	12.5	12.7	11.1	9.5	11.3	
	Glasses	2.2	0.7	0.0	0.3	0.8	
Information on pesticide use (%)	Previous experience/Reading instructions	22.7	24.8	15.6	11.9	18.4	18.17 *
	Agriculture extension services	10.9	8.8	6.2	8.5	9.0	
	Other farmers	42.0	42.5	46.9	48.5	45.2	
	Agrochemical retailers	24.4	23.9	31.2	31.1	27.5	
Health problems related to pesticide use (%)	Headache/Coughing	28.0	26.6	28.0	23.5	25.5	13.64 ns
	Stomachache	13.3	6.5	6.5	9.2	9.0	
	Skin irritation	24.0	27.9	28.0	26.8	26.7	
	Eye irritation	20.4	21.1	23.7	21.9	21.6	
	Breathing problems	14.2	17.9	14.0	18.6	17.3	

Note: PPE = Personal protective equipment

Table 2. List of commercial insecticides and corresponding active ingredients used in the study areas

Commercial Name	Active Ingredient	Family	WHO Class	Adoption Rate (%)
Cyperscope 5EC	Cypermethrin 5%	Pyrethroid	II	6.8
Dudu Aba+	Abamectin 2%	Avermectin	Ib	5.8
Dudu acelamectin 5%EC	Abamectin 2% + acetamiprid 3%	Avermectin + Neonicotinoid	Ib + II	13.0
Dudu alpha 3EC	Alpha-cypermethrin 3%	Pyrethroid	II	17.1
Dudu cyper 5% EC	Cypermethrin 5%	Pyrethroid	II	2.1
Lava 100% EC	Dichlorvos 100%	Organophosphorus	Ib	2.5
Kuu-Kill	Chlorpyrifos 48%	Organophosphorus	II	0.5
Roket +	Profenofos 40% + cypermethrin 4%	Organophosphorus + Pyrethroid	II + II	20.1
Simba +	Cypermethrin 5%	Pyrethroid	II	2.2
Tafgor 40EC	Dimethoate 40%	Organophosphorus	II	6.1
Thiodan	Endosulfan 50%	Organochlorine	II	23.6

Note: Based on the WHO (World Health Organization) Classification, Ib = highly hazardous, II = moderately hazardous [2].

Figure 3. Selected pictures of chemical insecticides used in the survey areas.

DISCUSSION AND CONCLUSIONS

- A total of eleven insecticide formulations were identified, including pyrethroids, organophosphates, avermectins, neonicotinoids, and organochlorines, with pyrethroid-based formulations ranking first.
- Concerns arise due to the widespread use of moderately to highly hazardous insecticides and banned or restricted active ingredients such as endosulfan and acetamiprid.
- Insufficient use of PPE and limited training on safe pesticide handling remain further challenges. Farmers reported experiencing health issues related to pesticide use.

It is important to promote *farmer training on agroecological principles and integrated pest management* (IPM) approaches to reduce dependence on chemical pesticides in vegetable farming. This involves the safe and proper use of chemicals when necessary, thereby mitigating risks to human health and the environment.

REFERENCES

[1] Balasha, A.M.; Mulume Dominique, A.; Mwisha Sage, W.; Mukonde Shadya, S.; Zirhumana Mugisho, J. (2023). Pesticide choice and use patterns among vegetable farmers on Idjwi island, eastern Democratic Republic of Congo. *SAGE Open* 13, 21582440231

[2] WHO (2019). *The WHO Recommended Classification of Pesticides by Hazard and Guidelines to Classification*, 2019 ed.; World Health Organization: Geneva, Switzerland. Available online: https://www.who.int/publications/i/item/9789240005662

ACKNOWLEDGMENTS

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