Study on health effects of pesticide exposition on small-scale farmers and farm workers in conventional and organic agriculture (Bananas) in Ecuador

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ENCOUNTER OF BANANA WORKERS
For their Rights, for Health and Nature

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SÜDWIND

1. Background and objectives

Farm workers and small-scale farmers in conventional banana agriculture are heavily exposed to pesticides. However, the debate on pesticides is dominated by consumer concerns about pesticide residues in food and less attention is given to farmers and their families who are exposed to higher concentrations of pesticides than the general population. Farm workers in the countries of the Global South have little knowledge about the health risks posed by pesticides (due to insufficient training provided by employers, lack of workers' rights, low levels of reading or writing, chemicals label in a foreign language).

The aim of the project was to examine the working conditions and health (acute and chronic health effects) of (male) farm workers in Ecuador involved in banana cultivation. The health of workers in conventional farming which involves the use of pesticides was compared with the health of workers in organic/natural farming.

2. Study design and procedure

Study areas and participants

Study areas were identified with the support of local organisations (ASTAC, UROCAL). These organisations also supported recruitment of participants. In total 71 farmworkers, mean age 45.5 years, volunteered to participate. No significant differences between the physiological attributes of the two groups (pesticide users and non-pesticide users) were identified. The examination (detailed below) was conducted in the provinces Los Rios (Quevedo, La Unión, Valencia) and El Oro (La Libertad, Buenavista).

Examinations conducted

The investigation consisted of two parts; a medical questionnaire survey and buccal mucosa swabs. For the medical survey, interviews were conducted by trained study assistants using standardised questionnaires to examine health symptoms, working conditions (e.g. pesticides used, safety measures) and living conditions (e.g. proximity to plantations). Buccal mucosal swabs were obtained in order to undertake micronucleus assays in order to study cytotoxic or genotoxic (damages of cells or genetic material) changes associated with pesticide exposition. To perform the tests, first simple swabs of buccal mucosa cells with wooden spatulas were taken which are painless and involve no risks for the participants. The further assessment of the cells was performed by experienced experts in an appropriate laboratory in Vienna. The cells were scored for changes such as (additional) micronuclei, nuclear buds etc. Such nuclear anomalies are an initial indication of exposure to carcinogenic pesticide.

3. Summary of results

Results of the questionnaire survey

The participants were surveyed regarding health symptoms observed in the past six months, which can be attributed to possible toxic effects by pesticides.

The results demonstrated significant differences between the two groups (those working with pesticides and those working without). Both symptoms of local irritation (skin, upper respiratory tract, eyes) and systemic symptoms such as fatigue, nausea and dizziness were considerably more frequent in workers exposed to pesticides. This indicates that the use of pesticides could be associated with acute adverse health effects in farm workers. It was also found that workers exposed to pesticides had a 6-8 fold increased risk for reporting gastrointestinal symptoms (mostly nausea, vomiting, diarrhoea) compared with those not exposed to pesticides (Table 1).

Workers exposed to pesticides are exposed to biocides through two routes: applying pesticides to plants and exposure through aerial spraying. The analysis revealed that effects of pesticides through aerial spraying was perceived considerably more often by pesticide users than non-pesticide users. It has to be noted that this method of application has been banned in the EU since 2009 (due to the risks associated with pesticide drift) and is only allowed in rare exceptional cases (after warning people).

Although almost all pesticide users surveyed acknowledge that pesticides are harmful to health, only 20 percent of the respondents always use masks and/or gloves. A main reason for this inadequate use of personal protective measures is that masks and gloves are not available and/or not provided by employers. A cause for concern is the high number of persons with no apparent knowledge about the pesticides they are applying. This may be based on actual lack of knowledge or on the reluctance of participants to give any information on this issue (fear of consequences).

Pesticides in use which were mentioned by participants included chemicals classified as probably carcinogenic (glyphosate, Ethoprop) or already banned in the EU (Paraquat).

Table 1
Frequency of self-reported symptoms of pesticide and non-pesticides users in percent; stat. significant differences in bold.

Symptom	Pesticide users	Non-pesticide users
Headache	**58%**	**46%**
Vision problems	45%	49%
Dizziness	**65%**	**24%**
Nausea, vomiting	42%	8%
Excess salivation	48%	30%
Strong fatigue	**68%**	**32%**
Exhaustion	**71%**	**46%**
Stomach pain	**45%**	**27%**
Diarrhoea	**26%**	**8%**
Sleeplessness	55%	27%
Burning eyes	61%	32%
Skin irritations	**45%**	**16%**
Runny nose	29%	14%
Breathing difficulties	32%	14%
Irregular heartbeat	29%	5%
Watering eyes	52%	21%
Skin rashes	23%	8%
Cough	35%	22%
Twitches, tremor	13%	5%

Results of the Human Biomonitoring examination (Micronucleus assays)

The examinations of the buccal mucosa cells identified higher rates of nuclear anomalies in pesticide users, demonstrating a concerning association of agrochemicals with long-term health risks (Figure 1). The impact of pesticide use is not restricted to acute health effects, which are clearly more frequent in the exposed group. The results of the study suggest that pesticide users have a higher risk of developing cancer. The findings underline the urgent need for protection measures for the affected farm workers in banana plantations.

4. Conclusion

Overall we can conclude from our results that workers exposed to pesticides do not only suffer from a higher frequency of acute and chronic health symptoms due to these symptoms, but are also at an increased risk of developing cancer.

From the perspective of occupational medicine priority should be given to simple measures to reduce exposure, in addition to use of less toxic products. Such measures include appropriate provision and use of personal equipment to protect the respiratory organs, eyes and hands and fundamentally: trainings for appliers to - ideally - improve knowledge and awareness regarding the application of chemicals and the involved hazards.

Finally, this study emphasises that a reduction in the use of pesticides, i.e. switching to natural cultivation methods, would both improve the health status of the local farming population and the quality of the products. This is also in line with other health concerns and campaigns working to protecting the health of consumers.

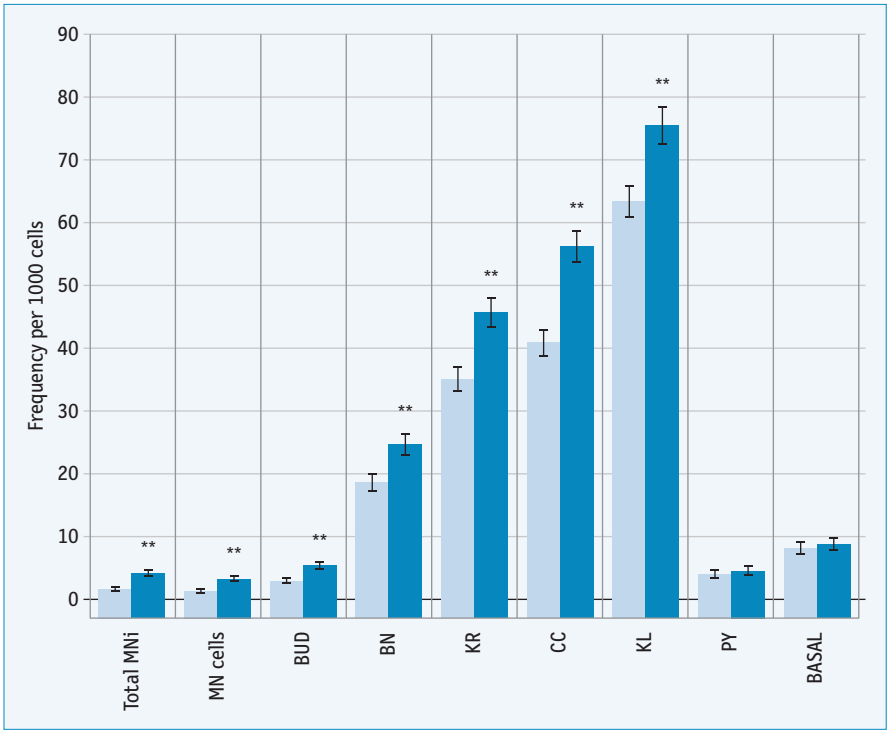

Figure 1
Nuclear anomalies in buccal mucosa cells of nonusers of non-pesticide (n=37, light bars) and pesticide users (n=31, dark bars). The y-axis indicates the frequencies of cellular anomalies per 1,000 cells. Bars and whiskers represent means and 95 % confidence intervals by non-pesticide users and pesticide users; **p<0.01;
Total MNi: Total number of micronuclei
MN cells: micronucleated cells (number of viewed cells with micronuclei)
BUD: Cells with nuclear buds („broken egg")
BN: Binucleated cells
KR: Karyorrhexis
CC: Condensed chromatin
KL: Karyolysis
PY: Pyknosis
BASAL: Basal cells.