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ADMINISTRATIVE INFORMATION**Support** - None.**Review Stage at time of this submission** - Data analysis.**Conflicts of interest** - None declared.**INPLASY registration number:** INPLASY202650042**Amendments** - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 8 May 2026 and was last updated on 8 May 2026.**INTRODUCTION**

Review question / Objective This scoping review aims to map the existing evidence on occupational biocide exposure and associated mucocutaneous adverse effects among agricultural workers in Asia. Specifically, it seeks to identify the types of biocides reported in agricultural settings, describe the prevalence and nature of mucocutaneous manifestations, examine contributing exposure-related factors, and highlight gaps in the current literature to guide future research and occupational health interventions.

Background Biocides, including pesticides, insecticides, herbicides, fungicides, and related agricultural chemicals, are widely used to protect crops and improve agricultural productivity. However, occupational exposure may cause mucocutaneous adverse effects among agricultural workers, particularly through dermal contact, splashes, aerosols, and contaminated equipment or clothing. Reported effects include dermatitis,

skin irritation, rashes, pruritus, eye irritation, mucosal irritation, and chemical burns.

Asia is an important region for this issue because agricultural work remains common, biocide use is widespread, and safety practices vary across countries. Hot and humid working conditions may also reduce the consistent use of personal protective equipment, increasing exposure risk. Although several studies have examined pesticide-related health effects, evidence specifically addressing mucocutaneous outcomes among Asian agricultural workers remains scattered and heterogeneous.

Therefore, this scoping review aims to systematically map the available evidence on biocide exposure and mucocutaneous adverse effects among agricultural workers in Asia, identify key exposure patterns and reported outcomes, and highlight gaps for future research and occupational health interventions.

Rationale Agricultural workers are frequently exposed to biocides during mixing, spraying, handling, and cleaning activities, making them

vulnerable to direct dermal and mucosal contact. Although biocide-related systemic toxicity has been widely discussed, mucocutaneous outcomes such as dermatitis, skin irritation, eye symptoms, mucosal irritation, and chemical burns are often less systematically summarized.

In Asia, the risk may be influenced by high agricultural activity, extensive biocide use, variable regulatory enforcement, limited access to personal protective equipment, and climate-related barriers to protective practices. However, the available evidence is heterogeneous in terms of study design, exposure assessment, reported symptoms, and geographic setting. A scoping review is therefore appropriate to map the current literature, clarify the range of reported mucocutaneous effects, identify exposure-related factors, and highlight research gaps. The findings may support future epidemiological studies, occupational safety interventions, and policy development to reduce biocide-related health risks among agricultural workers.

METHODS

Strategy of data synthesis A systematic search will be conducted in PubMed, Scopus, and the Directory of Open Access Journals (DOAJ) for studies published from 2005 to January 2025. Search terms will include combinations of keywords and MeSH terms related to biocides, pesticide exposure, agricultural workers, occupational exposure, and mucocutaneous outcomes. The main search terms will include: “biocide,” “pesticide,” “fungicide,” “herbicide,” “insecticide,” “agricultural chemical,” “agrochemical,” “occupational exposure,” “environmental exposure,” “pesticide use,” “dermatitis,” “skin disease,” “mucosal irritation,” “allergic reaction,” “chronic skin condition,” “mucocutaneous effect,” “agricultural worker,” “farm worker,” and “Asia,” including specific Asian country names.

Data will be extracted and charted using a standardized form, including author, year, country, study design, sample size, type of biocide exposure, mucocutaneous outcomes, prevalence of symptoms, and relevant exposure-related factors. Findings will be synthesized descriptively using tables and narrative summary. No meta-analysis will be performed because heterogeneity is expected in study design, exposure definitions, and outcome reporting.

Eligibility criteria This scoping review will include observational and cross-sectional studies involving agricultural workers aged over 18 years in Asian countries. The review concept is occupational

exposure to biocides, including pesticides, insecticides, herbicides, fungicides, and related agricultural chemicals, and associated mucocutaneous outcomes such as dermatitis, skin irritation, rashes, pruritus, eye irritation, mucosal irritation, allergic reactions, chemical burns, or chronic skin conditions.

The context is agricultural settings in Asia. Studies must report biocide exposure in relation to mucocutaneous health effects and be published in English from 2005 to January 2025. Studies focusing only on systemic toxicity, non-agricultural exposure, non-human subjects, in vitro models, or lacking sufficient outcome data will be excluded.

Source of evidence screening and selection All identified records will be imported into a reference management program, and duplicates will be removed. Two reviewers will independently screen titles and abstracts against the eligibility criteria. Potentially relevant articles will then undergo full-text review. Reasons for exclusion at the full-text stage will be recorded. Any disagreements between reviewers will be resolved through discussion and consensus. If consensus cannot be reached, a third reviewer will be consulted. The selection process will be summarized using a PRISMA-ScR flow diagram.

Data management Search results will be exported to a reference management program for duplicate removal and organization. Screening decisions, eligibility assessment, and reasons for exclusion will be recorded systematically. Extracted data will be managed using a standardized data charting form in Microsoft Excel. The extracted variables will include author, publication year, country, study design, sample size, type of biocide exposure, mucocutaneous outcomes, symptom prevalence, and relevant exposure-related factors. Data will be checked by two reviewers to ensure accuracy and consistency before synthesis.

Reporting results / Analysis of the evidence The results will be reported according to the PRISMA-ScR guidance. Study characteristics and extracted findings will be summarized in tables, including country, sample size, study design, type of biocide exposure, mucocutaneous outcomes, symptom prevalence, and relevant exposure-related factors. The evidence will be synthesized descriptively using a narrative approach to map the extent, nature, and distribution of available studies. Key patterns in exposure types, reported mucocutaneous effects, and protective practices will be identified. Due to expected heterogeneity in

study design, exposure assessment, and outcome reporting, no meta-analysis will be performed.

Language restriction English.

Country(ies) involved Thailand.

Keywords Biocides; pesticides; occupational exposure; agricultural workers; dermatitis; mucocutaneous manifestations.

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