

Pesticide Science and Pest Control

Review Article

Status of Pest and Disease Management in Cereal and Pulse Production Systems of Southern Ethiopia: Review of Published Studies (2000–2025)

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Abstract

Cereal and pulse crops are essential to the livelihoods, food security, and income of millions of farmers in Ethiopia. In Southern Ethiopia, particularly in Ari, Konso, South Omo, and Basketo zones, the production of crops such as maize, sorghum, wheat, common bean, cowpea, and faba bean is frequently threatened by various insect pests and diseases. This review summarizes published studies conducted between 2000 and 2025 on the status of pest and disease management practices in cereal and pulse production systems in these areas. Information was gathered from journal articles, research reports, theses, and institutional publications focusing on major pests, diseases, management strategies, and existing challenges. The review showed that diseases such as rust, anthracnose, smut, blight, and viral infections are common problems affecting crop productivity. Similarly, insect pests including fall armyworm, stalk borers, aphids, bean beetles, and storage pests continue to cause serious yield losses both in the field and during storage. Farmers mainly depend on traditional cultural practices and chemical pesticides for control, while the use of integrated pest management approaches is still limited. The review also identified challenges such as limited access to resistant crop varieties, inadequate extension support, low awareness of sustainable pest management practices, and the increasing influence of climate variability on pest and disease occurrence. Overall, the findings indicate the need for stronger research efforts, improved farmer training, wider promotion of integrated pest management strategies, and better institutional support to ensure sustainable cereal and pulse production in Southern Ethiopia.

Key words: Cereal crops, Crop protection, Disease management, Integrated pest management, Pest management, Pulse crops

Introduction

Cereal and pulse crops are among the most important agricultural commodities in Ethiopia and play a major role in ensuring food security, improving nutrition, and supporting the livelihoods of millions of smallholder farmers. Crops such as maize, sorghum, wheat, teff, barley, common bean, haricot bean, cowpea, and faba bean are widely cultivated across different agroecological zones of the country [1]. In Southern Ethiopia, particularly in Ari, Konso, South Omo Zone, and Basketo, cereal and pulse production forms the backbone

of rural livelihoods and contributes significantly to household income and local food systems [2].

Despite their importance, the productivity of these crops remains low due to several production constraints. Among these, insect pests and plant diseases are considered some of the most serious challenges limiting crop yield and quality [3]. Diseases such as rusts, smuts, blights, anthracnose, bacterial wilt, and viral infections frequently affect cereal and pulse crops in different parts of Ethiopia. Similarly, in-

sect pests including fall armyworm, stalk borers, aphids, pod borers, bean beetles, and storage pests cause substantial losses both in the field and during postharvest storage [4]. These problems have become more severe in recent years because of climate variability, expansion of invasive pests, and limited access to effective crop protection technologies [5].

Southern Ethiopia has favorable climatic conditions for crop production, but these conditions also support the rapid multiplication and spread of many pests and diseases. Farmers in Ari, Konso, South Omo, and Basketo zones regularly face pest outbreaks and disease epidemics that reduce productivity and threaten household food security [6]. In many areas, farmers mainly rely on traditional cultural practices and chemical pesticides to manage crop pests and diseases. However, the adoption of integrated pest management (IPM) practices remains limited because of weak extension services, inadequate farmer training, limited access to resistant crop varieties, and poor pest monitoring systems [7]. Improper pesticide use also creates environmental and health-related concerns for farming communities.

Recent studies conducted in Southern Ethiopia have highlighted the increasing importance of sustainable crop protection research and integrated management practices. A review by [8] and discussed the major biotic threats affecting crop production and food security in Southern Ethiopia, including diseases, insect pests, and parasitic weeds. The study emphasized that poor pest management practices, limited awareness among farmers, and changing climatic conditions continue to increase crop losses in many production areas. The review also recommended strengthening integrated pest management strategies, improving extension support, and promoting research-based agricultural technologies to enhance sustainable crop production in the region. Over the past two decades, several studies have been conducted on cereal and pulse crop protection in Ethiopia. However, most of the available information is fragmented and scattered across journals, institutional reports, and academic theses. In addition, limited review studies have specifically focused on Southern Ethiopia despite the region's agricultural importance and increasing pest and disease pressures. Therefore, reviewing and summarizing existing research findings is essential to better understand the major pests and diseases affecting cereal and pulse crops, evaluate current management practices, and identify research and development gaps for future interventions.

Therefore, this review aims to assess the status of pest and disease management in cereal and pulse production systems in Ari, Konso, South Omo, and Basketo zones of Southern Ethiopia based on studies published between 2000 and 2025. The review specifically focuses on major insect pests and diseases, current management approaches, existing challenges, and future opportunities for sustainable crop protection and improved agricultural productivity in the region.

Literature Review Methodology

This review was conducted to assess the status of pest and disease management practices in cereal and pulse production systems in Southern Ethiopia, with particular emphasis on studies carried out in Ari, Konso, South Omo Zone, and Basketo between 2000 and 2025. A systematic literature review approach was employed to collect, evaluate, and synthesize relevant published and unpublished information related to cereal and pulse crop protection.

Sources of Literature

Relevant literature was gathered from different academic and institutional sources, including peer-reviewed journal articles, conference proceedings, MSc and PhD theses, books, technical reports, and government publications. Online databases and search engines such as Google Scholar, ResearchGate, Scopus, and PubMed were used to identify relevant studies. In addition, reports and publications from institutions such as the Ethiopian Institute of Agricultural Research (EIAR), Ministry of Agriculture (MoA), universities, and international organizations including FAO were reviewed.

Search Strategy

The literature search was conducted using combinations of keywords related to cereal and pulse crop protection. Major search terms included: "cereal crop pests in Ethiopia," "pulse crop diseases in Southern Ethiopia," "integrated pest management," "crop protection," "fall armyworm," "maize diseases," "bean diseases," "storage pests," "pest management practices," "South Omo agriculture," "Konso crop diseases," "Ari farming systems," and "Basketo crop production." Boolean operators such as AND OR were used to refine the search process and improve the relevance of retrieved studies.

Inclusion and Exclusion Criteria

Studies included in this review were selected based on their relevance to cereal and pulse crop pest and disease management in Ethiopia, particularly in Southern Ethiopia. Priority was given to studies:

- Published between 2000 and 2025,
- Conducted in Ari, Konso, South Omo, Basketo, and nearby areas,
- Focused on cereal and pulse crops,
- Addressing insect pests, diseases, or integrated pest management practices,
- Written in English and accessible in full text.

Studies unrelated to crop protection, duplicated reports, and publications lacking sufficient methodological information were excluded from the review.

Data Collection and Analysis

Relevant information was extracted from the selected stud-

ies and organized according to crop type, major pests and diseases reported, affected areas, management practices, and key findings. The collected information was then summarized and analyzed using descriptive and thematic approaches. Particular attention was given to identifying commonly reported pests and diseases, existing management strategies, research gaps, and challenges affecting sustainable crop protection in Southern Ethiopia.

Scope of the Review

The review focused mainly on major cereal crops such as maize, sorghum, wheat, barley, and teff, as well as pulse crops including common bean, haricot bean, cowpea, and

faba bean. Emphasis was placed on field and storage pests, economically important diseases, and integrated pest and disease management approaches practiced by farmers, researchers, and extension systems in Southern Ethiopia.

Results Of Literature Review

The reviewed studies (2000–2025) revealed that cereal and pulse production systems in Southern Ethiopia are affected by a wide range of insect pests and diseases (table 1, 2 and 3). The severity and distribution of these constraints vary across agroecologies and crop types.

Crop	Major insect pests	Damage type	Zones	Management	References
Maize	Fall armyworm, stem borers, aphids	Defoliation, tunneling	Ari, South Omo, Konso	Chemicals, rotation, resistant varieties	[1–5]
Sorghum	Stem borers, shoot fly	Seedling death, weak plants	South Omo, Basketo	Intercropping, pesticides	[6–8]
Wheat	Aphids, armyworms	Leaf feeding, yield loss	Konso	Fungicides, resistant varieties	[9–10]
Teff	Wollo bush cricket, aphids	Leaf damage	Ari, Konso	Cultural control	[11–12]
Common bean	Bean beetles, aphids, pod borers	Pod damage, seed loss	Ari, Konso, South Omo	Seed dressing, IPM	[18–20]
Faba bean	Aphids, pod borers	Flower and pod damage	Basketo	Fungicides, resistant varieties	[21–22]
Cowpea	Pod borers, aphids	Seed damage	South Omo	Intercropping, pesticides	[26–27]

Table 1. Major insect pests of cereal and pulse crops in Southern Ethiopia

Crop	Major diseases	Causal agents	Affected zones	Management practices	References
Maize	Leaf blight, rust, MLN	Fungi, viruses	All zones	Resistant varieties, fungicides	[13,14,15]
Sorghum	Anthrachnose, smut	Fungi	South Omo	Seed treatment, rotation	[16,17]
Common bean	Anthrachnose, rust	Fungi	Ari, Konso	Chemical control, resistant varieties	[18,19,20]
Faba bean	Chocolate spot, rust	Fungi	Basketo	Fungicides, improved varieties	[21,22]

Table 2. Major diseases of cereal and pulse crops in Southern Ethiopia

Crop	Storage pests	Type of damage	Control methods	References
Cereals	Weevils, grain borers	Grain weight loss	Hermetic storage, fumigation	[23,24,25]
Pulses	Bruchids	Seed perforation	Botanical pesticides, chemicals	[26,27,28]

Table 3. Post-harvest pests and management practices in Southern Ethiopia

Yield losses due to insect pests and disease on cereal and pulse crops

Estimated Yield Losses of Pulse Crops Due to Pests and Diseases in four zone presented in table 4 and 5.

Crop	Major Pest/Disease	Zone	Estimated Yield Loss (%)
Maize	Fall armyworm (<i>Spodoptera frugiperda</i>)	Ari, South Omo	20–50
Maize	Turicum leaf blight	Ari	30–70
Maize	Maize lethal necrosis disease	South Omo	25–60
Sorghum	Anthraxnose	Konso, South Omo	20–45
Sorghum	Stem borer	Konso	15–40
Wheat	Stem rust and yellow rust	Basketo, Ari	20–50
Teff	Rust and leaf spot	Basketo	15–35
Finger millet	Blast disease	South Omo	20–40
Cereals (general)	Striga weed infestation	Konso, South Omo	30–100

Table 4. Estimated yield losses in cereal crops in Ari, Konso, South Omo, and Basketo zones

Crop	Major Pest/Disease	Zone	Estimated Yield Loss (%)
Common bean	Bean root rot	Ari, Basketo	20–60
Common bean	Bean fly and pod borer	South Omo	15–45
Haricot bean	Leaf miner	Konso	15–35
Chickpea	African bollworm (<i>Helicoverpa armigera</i>)	Basketo	20–40
Field pea	Rust and pod borer	Ari	15–35
Mung bean	Root rot and leaf miner	South Omo	20–45
Groundnut	Root rot and termites	South Omo	15–40
Sesame	Stink bug and mealybug	Konso	20–50
Pulse crops (general)	Storage insect pests	All zones	10–35

Table 5. Estimated yield losses in pulse crops in Ari, Konso, South Omo, and Basketo zones

Discussion

The present review confirmed that insect pests and diseases are major production constraints affecting cereal and pulse crops in Ari, Konso, South Omo, and Basketo zones of Southern Ethiopia. Yield losses varied depending on crop type, agroecology, climatic conditions, and management practices. Similar findings were reported by several studies in Ethiopia indicating that biotic stresses significantly reduce agricultural productivity and threaten food security.

Among cereal crops, maize was highly affected by fall armyworm, Turicum leaf blight, and maize lethal necrosis disease. Fall armyworm has become one of the most destructive invasive pests in Ethiopia, particularly in lowland and midland agroecologies. Severe infestations caused estimated yield losses ranging from 20–50% in Ari and South Omo zones. Turicum leaf blight also caused substantial yield reduction under humid conditions in Ari areas.

Sorghum production was constrained by anthracnose, stem borers, and Striga infestation. Heavy Striga infestation caused yield losses reaching up to complete crop failure in moisture-stressed areas. Wheat and teff production were also severely affected by rust diseases, particularly in Basketo and Ari zones.

Pulse crops including common bean, chickpea, field pea, and mung bean were seriously affected by fungal diseases and insect pests. Bean root rot, pod borers, leaf miners, and African bollworm caused major economic losses. Continuous cultivation without crop rotation and poor field sanitation increased disease incidence and pest severity.

The review further indicated that post-harvest losses caused by storage insect pests remain serious problems due to traditional grain storage systems. Farmers commonly use local storage structures that favor pest multiplication, leading to quantitative and qualitative grain losses during storage.

Overall, the findings highlight the urgent need for integrated pest and disease management strategies including resistant varieties, crop rotation, biological control, improved storage technologies, and farmer-centered extension services.

Conclusion

The review clearly demonstrates that cereal and pulse crops in Southern Ethiopia are significantly affected by insect pests and diseases, which remain the major limiting factors to productivity. Key pests such as fall armyworm, stem bor-

ers, aphids, and bruchids, along with diseases such as rust, blight, anthracnose, and smut, are widespread across Ari, Konso, South Omo, and Basketo zones.

Although several management practices exist, including chemical control and cultural methods, their effectiveness is limited due to poor implementation and low adoption of integrated pest management strategies. Therefore, sustainable crop protection approaches are urgently needed to enhance productivity and ensure food security in the region.

Recommendations

Based on the findings of this review on pest and disease management in cereal and pulse production systems in Southern Ethiopia, the following recommendations are forwarded:

1. Strengthen integrated pest and disease management (IPM) programs through continuous farmer training and participatory extension approaches in Ari, Konso, South Omo Zone, and Basketo.
2. Promote the development and dissemination of disease- and pest-resistant cereal and pulse varieties adapted to local agroecological conditions.
3. Strengthen early warning and pest surveillance systems to detect and manage outbreaks (e.g., fall armyworm and rust diseases) at an early stage.
4. Improve access to affordable and environmentally safe pest control technologies, including biopesticides and botanical extracts.
5. Encourage farmers to adopt climate-smart agricultural practices such as crop rotation, intercropping, and timely planting to reduce pest buildup.
6. Reduce over-reliance on chemical pesticides by promoting safe pesticide use training and awareness on environmental and health impacts.
7. Expand research collaboration among universities, regional agricultural offices, and research institutes to generate location-specific pest management technologies.
8. Promote improved post-harvest storage technologies (e.g., hermetic storage bags and silos) to reduce storage pest losses.

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