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# Toxin-induced fissured palmoplantar dermatitis secondary to chronic occupational exposure to agricultural chemicals: A Case Report

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**Abstract**

Occupational exposure to agricultural chemicals is a significant but often under-recognized cause of chronic dermatological conditions. This case report describes a 42-year-old male agricultural worker presenting with painful fissures, hyperkeratosis, scaling, itching, and blackish discoloration over both soles for 18 months, with marked seasonal exacerbation during harvesting periods. Clinical examination revealed symmetrical plantar hyperkeratosis with deep fissures and tenderness, impairing ambulation. Based on occupational history and morphology, the condition was diagnosed as toxin-induced fissured palmoplantar dermatitis secondary to chronic agrochemical exposure. From an integrative perspective, the presentation was correlated with *Dooshivisha Janya Vipadika*, indicating cumulative low-grade toxic insult manifesting as chronic plantar dermatosis. Management involved a detoxification-oriented approach followed by internal and external restorative therapies, along with dietary regulation and exposure control. Significant reduction in itching and pain was observed early, followed by progressive healing of fissures and improvement in skin texture within 14 days. Functional mobility improved substantially, though hyperpigmentation resolved more slowly. This case highlights the importance of detailed occupational history, recognition of cumulative toxic injury in chronic dermatoses, and the potential benefit of a comprehensive management strategy addressing both exposure and barrier restoration.

**Key words :** *Agadatantra*, *Ayurveda*, *Dooshivisha*, Ocuupational exposure, Plantar hyperkeratosis.

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Occupational exposure to agricultural chemicals is a significant public health concern globally, particularly in low- and middle-income countries where regulatory oversight and protective practices may be inconsistent. A range of cutaneous manifestations have been seen associated with chronic dermal exposure to pesticides, herbicides, and related agrochemicals which ranges from irritant and allergic contact dermatitis to hyperkeratotic and fissured dermatoses of the palms and soles[3]-[5]. The palmoplantar skin has unique structural characteristics which includes a thick stratum corneum. Repeated mechanical stress might develop chronic hyperkeratosis, painful fissuring, and functional impairment. Almost 80% of work-related dermatoses are irritant contact dermatitis[5]. Agricultural workers are vulnerable because of repeated unprotected handling of organophosphates, carbamates, pyrethroids, and other agrochemical formulations[1]. Even though, chronic low-grade exposure may not produce acute toxicity, it can induce cumulative epidermal barrier disruption, inflammatory cytokine activation, oxidative stress, and altered keratinocyte differentiation[9]. Clinically, this can manifest as hyperkeratotic fissured dermatitis over time, especially over pressure-bearing areas such as the soles and the palmar creases[13,14]. Conventional topical therapy is not effective in palmoplantar fissured dermatitis if the toxic exposure persists[3]. Diagnosis is also challenging due to overlapping clinical features with that of palmoplantar psoriasis, hyperkeratotic eczema, and keratoderma[3]. Detailed occupational history is thus a critical factor for identifying chronic chemical exposure as an etiological factor.

Traditional and indigenous medical systems have conceptualised chronic low grade toxin accumulation from a traditional toxicological perspective. *Dooshivisha* is a condition explained in Ayurveda, which describes a latent, cumulative toxic state capable of producing chronic dermatological manifestations.[1] These cutaneous disorders include fissured palmoplantar lesions which resembles a pathological condition called *Vipadika*.[7,8] This perspective highlights the role of subacute toxin exposure in chronic inflammatory skin conditions. Even though this concept is based on a distinct epistemological framework, it aligns concep-tually with modern understandings of cumulative chemical injury. This case report highlights the importance of integrating dermatological assessment, occupational health evaluation, and toxicological considerations in the management of chronic hyperkeratotic dermatoses.

*Case Presentation*

*Patient Information*

A 42-year-old male agricultural worker presented with complaints of chronic painful fissures over both soles for past 18 months. He also presented with associated complaints such as severe scaling, hyperkeratosis, blackish discoloration, moderate itching, and difficulty in walking due to pain. A seasonal exacerbation pattern was observed in the occurrence of symptoms. The symptoms worsened particularly during the harvesting period when the patient had increased exposure to agricultural chemicals. The patient had previously been treated with topical allopathic medications, which provided only temporary symptomatic relief. Due to

recurrent symptoms and progressive functional limitation, he sought further evaluation and treatment.

*Clinical Findings :*

The patient was apparently healthy prior to the onset of symptoms 1.5 years earlier. The condition started gradually with itching and discoloration of the soles, followed by progressive thickening, dryness, fissuring (heel cracks), and severe pain.

*Aggravating and Relieving Factors :*

The patient reported aggravation of symptoms with increased agrochemical exposure, while he consumed spicy foods and especially during night hours. Patient had temporary relief with topical medications.

*Personal History :*

Patient had a moderate appetite, followed a vegetarian diet with irregular bowel habits and regular micturition. His sleep was disturbed due to pain.

*Medical History :*

Patient had no history of hypertension/ diabetes mellitus/systemic illness/similar dermatological disease in the past. He also reported that he had no family history of psoriasis or chronic skin disorders.

*General Examination :*

With normal appearance and moderate built, the patient showed absence of pallor, icterus, oedema and cyanosis. He had stable vitals with a blood pressure of 130/80 mmHg, pulse Rate 74/min and Respiratory Rate 18/min.

*Dermatological Examination :*

The patient presented with marked dryness, hyperkeratosis, scaling, deep fissures and blackish discolouration with symmetrical distribution on bilateral soles. On palpation, tenderness was observed over the fissured areas. There was no involvement of palms, nails, scalp, or other body areas. No well-demarcated erythematous plaques suggestive of psoriasis were observed. No vesiculation or acute exudative lesions were present.

Table-1. Timeline of Clinical Events and Symptom Progression

| Time Period | Clinical Events |
|---|---|
| 18 months prior | Gradual onset of itching and blackish discoloration over both soles |
| Following months | Development of dryness, scaling, thickening, and painful fissures |
| Seasonal pattern observed | Symptoms aggravated during harvesting season with increased agrochemical exposure |
| Intermittent period | Temporary relief with topical allopathic medications |
| Presentation to clinic | Persistent fissures, severe pain impairing walking, recurrent seasonal exacerbation |

*Differential Diagnosis :*

Several dermatological conditions were considered before establishing the final diagnosis.

Table-2. Differential diagnosis

| Condition | Key Typical Features | Reason Excluded in Present Case |
|---|---|---|
| Palmoplantar Psoriasis | Well-demarcated erythematous plaques, silvery scales, nail/scalp involvement | No nail or scalp lesions; absence of classical psoriatic plaques |
| Hyperkeratotic Eczema | Thickening, scaling, fissuring; often chronic irritant/allergic etiology | Strong seasonal pattern and occupational agrochemical exposure suggest toxin-induced pathology |
| Palmoplantar Keratoderma | Diffuse hyperkeratosis; hereditary or non-inflammatory | No family history; adult onset; inflammatory symptoms present |

*Diagnostic Assessment :*

Based on the clinical history, documented occupational exposure, seasonal exacerbation during harvesting periods, and characteristic morphological findings, the condition was diagnosed as toxin-induced fissured palmoplantar dermatitis secondary to chronic occupational exposure to agricultural chemicals. From an Ayurvedic perspective, the presentation was correlated with *Dooshivisha Janya Vipadika*, characterized by *Pada Sphutana* (cracking of soles), *Ruja* (pain), Kandu (itching), and a chronic course with seasonal aggravation. The repeated exposure to agrochemicals was conceptually aligned with cumulative low-grade toxic exposure, and the clear temporal relationship between symptom worsening and harvesting season strongly supports chronic dermal agrochemical contact as both the precipitating and perpetuating factor.

*Therapeutic Intervention :*

Considering the chronicity of the condition, seasonal aggravation, and suspected cumulative toxic exposure, a detoxification-oriented and restorative management approach was adopted.

*Shodhana* (detoxification therapy) was considered as the Phase 1 of the treatment. The treatment protocol started with *Snehapana* (internal oleation) using *Mahatiktakam Ghritam* administered in escalating doses as per classical guidelines. This was followed by *Virechana* (therapeutic purgation) using *Avipathy Choorna* (30 g). The patient tolerated the procedure well. By the evening following *Virechana*, he reported subjective improvement in itching and a sense of lightness and comfort in the soles.

Phase 2 of treatment was *Shamana Chikitsa* (Palliative Therapy). After completion of the purification phase, palliative therapy was initiated to maintain therapeutic effects and support tissue healing. Internal medications included *Patoladi Kwatha* administered at a dose of 15 mL twice daily with 60 mL of hot water before food, *Panchatikta Ghrita Guggulu* two tablets twice daily with hot water

after food, and *Dooshivishari Agada* two tablets twice daily with honey after food. External therapy consisted of *Sthanika Avagaha* (localized medicated immersion) using *Lodhrasevyadi Agada Kashaya*, followed by topical application of *Jeevanthyadi Yamaka* over the affected soles.

At discharge, the patient was advised to continue medications for 15 days, including *Nimbadi Kashaya* 15 mL twice daily, *Tikta Ghrita* one teaspoon twice daily, and *Dooshivishari Agada* two tablets twice daily. In addition, *Jeevanthyadi Yamaka* was prescribed for external application over the affected soles.

Dietary advice included avoidance of spicy, excessively salty, and irritant foods. The patient was also advised to minimize direct exposure to agricultural chemicals and to use protective footwear during fieldwork.

After completing the treatment protocol, the patient demonstrated remarkable clinical improvement. Plantar fissures showed progressive haling along with marked reduction in itching and pain intensity. Scaling and hyperkeratosis were notably reduced, and the patient reported improved comfort while walking. No adverse events or complications were observed during treatment.

*Outcome Measures :*

Assessment was performed at three time points, D0 (Before treatment), D7(During treatment (7th day)) and D14 (After completion of treatment (14th day)).

The selected line of management demonstrated clinically meaningful improvement. Mild relief from itching was observed immediately after the purification phase (*Snehapana* and *Virechana*). Subsequent Shamana therapy along with external interventions resulted in a marked reduction in pain, progressive healing of fissures, improvement in skin texture, and restoration of comfortable ambulation. Although hyperpigmentation (blackish discoloration) showed slower resolution, overall functional and

Table-3. Gradation of Clinical Parameters Before and After Treatment

| Symptom | D0 (Before Treatment) | D7 (7th Day) | D14 (After Treatment) |
|---|---|---|---|
| *Pani Pada Sphutana* (Fissures/Cracking) | Severe | Moderate | Mild |
| *Vedana* (Pain) | Severe | Mild–Moderate | Mild |
| *Kandu* (Itching) | Severe | Mild | Minimal |
| *Rookshata* (Dryness) | Severe | Moderate | Mild |
| *Kharata* (Roughness) | Severe | Moderate | Mild |
| *Syavatha* (Blackish Discoloration) | Moderate–Severe | Moderate | Mild–Moderate (minimal improvement) |

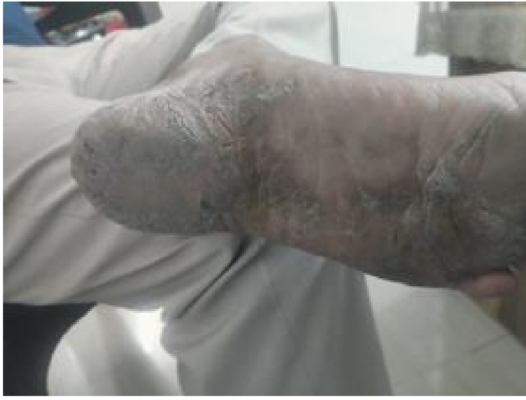


Figure 1. Before treatment

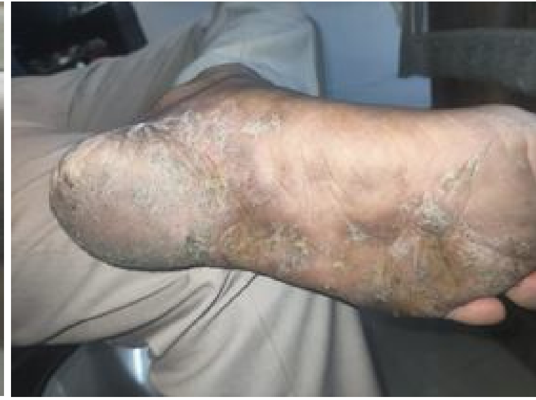
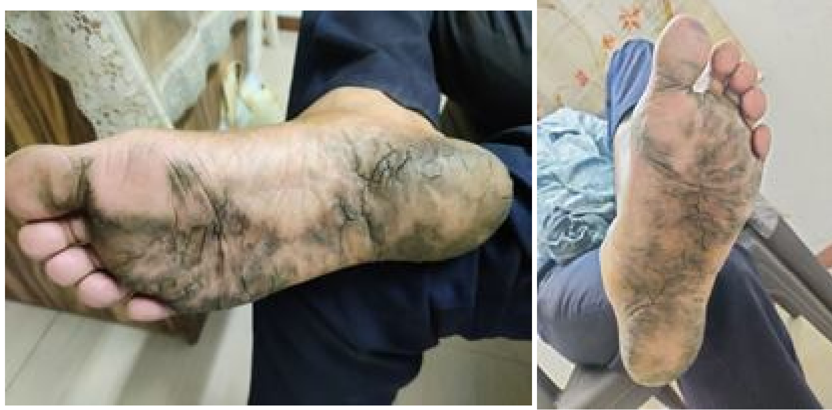


Figure 2. After treatment



symptomatic improvement was significant within 14 days.

Chronic dermal exposure of agricultural workers to organophosphates, carbamates, and pyrethroids is known to impair epidermal barrier integrity. This pathophysiology progresses through cumulative irritant effects, leading to increased trans epidermal water loss, keratinocyte dysfunction, and persistent cutaneous inflammation[9,11]. The clear seasonal exacerbation during harvesting periods in this present case, strongly supports chronic occupational exposure as a precipitating and perpetuating factor. Repeated chemical exposure disrupts the stratum corneum lipid matrix, increases permeability to irritants and triggers hyperproliferative and inflammatory responses[6]. Agrochemicals have also known to induce oxidative stress through the generation of reactive oxygen species (ROS) by activating pro-inflammatory pathways such as NF-κB and upregulating cytokines including TNF-α and IL-1β [6,10]. Persistent hyperkeratosis, fissuring, and delayed healing observed in toxin-induced palmoplantar dermatitis can thus be

explained by chronic low-grade inflammation. Mechanical stress on weight-bearing soles also amplifies fissure formation once barrier integrity is compromised.

Early reduction in itching following *Snehapana* and *Virechana* may be due to modulation of systemic inflammatory load and possible gut-skin axis interactions. These pathways are increasingly recognized in chronic inflammatory dermatoses[2]. *Shodhana* therapy may indirectly reduce inflammatory mediators and oxidative stress associated with cumulative toxic exposure. *Shamana* therapy and external interventions were associated with progressive healing of fissures, reduction in pain, and improved skin texture. Bitter (*Tikta*) formulations administered in this case are known for their anti-inflammatory and antioxidant properties in experimental studies. These activities contribute to attenuation of cytokine-mediated inflammation and oxidative stress[2]. Lipid-based medicated preparations enhance stratum corneum hydration and restore barrier lipids, thus improving skin flexibility. This in turn helps in reducing fissure depth and facilitates repair[12]. External therapies supported local wound healing through hydration, improved microcirculation, and reduction of secondary microbial colonization. An important observation was the comparatively slower resolution of hyperpigmentation. Post-inflammatory hyperpigmentation is known to persist due to melanocyte stimulation and delayed epidermal turnover[4]. This pattern of improvement suggests that the inflammation reduced first, while the skin pigmentation took longer to return to normal.

In the contemporary era, humans are continuously exposed to xenobiotics that adversely affect health. For this discussion, xenobiotics refer primarily to pesticides, fertilizers, and other synthetic chemicals widely used in agriculture. Contaminated air, food, and water represent major routes of exposure. Modern medicine increasingly acknowledges the role of environmental and dietary toxins in disease causation. Chronic exposure to neurotoxicants, incompatible food combinations, and residual agricultural chemicals significantly contribute to disease development. As the pathological effects often manifest only after prolonged periods, these factors are frequently overlooked. From an Ayurvedic standpoint, this scenario parallels the concept of *Dooshivisha*, wherein inadequately eliminated toxins persist in the body, remain dormant in deeper tissues due to *Kapha Avarana* (*Kaphavritatva*), and manifest under favorable conditions (*Varsha-gana-anubandhi*). While *Gara Visha* and *Dooshivisha* may present with similar manifestations, *Gara Visha* arises from initial exposure, whereas *Dooshivisha* results from repeated or chronic exposure with delayed clinical expression. Classical texts describe its impact through
*Sthaana Samshraya* and *Dhatu Pradoshaja Vikara* rather than listing specific diseases.

This case report, thus, highlights the importance of detailed occupational history in chronic palmoplantar dermatoses. Symptomatic topical therapy alone may be insufficient if chemical exposure persists. Combined detoxification-oriented management, barrier restoration strategies, and exposure reduction measures may provide prolonged and long-standing therapeutic benefit. However, limitations include short follow-up duration and absence of objective inflammatory markers. Longer-term monitoring is necessary to assess

recurrence and pigment resolution.

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