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# Identification of *Trichophyton spp.* Fungi on Farmers' Toenails in Jagalempeni Village, Brebes Regency

**Mohammad Afy Adly[1], Umi Nihayatul Khusna[2]**
*[1,2]Politeknik Mitra Karya Mandiri Ketanggungan Brebes, Indonesia*
*Email: afyadly230@gmail.com*



**Abstract**. Tinea unguium is a fungal infection caused by dermatophytes and frequently affects individuals in high-risk occupations, such as farmers. Humid working environments, direct contact with soil, and working barefoot increase the risk of fungal nail infections. This study aimed to identify the fungal species causing tinea unguium in the toenails of farmers in Jagalempeni Village, Wanasari District, Brebes Regency, Indonesia. A descriptive cross-sectional study was conducted using 15 toenail scraping specimens cultured on Sabouraud Dextrose Agar (SDA) and identified microscopically with Lactophenol Cotton Blue (LPCB) staining. The results showed the presence of both dermatophyte and non-dermatophyte fungi. Dermatophytes included Trichophyton rubrum (40%) and Trichophyton mentagrophytes (20%), while non-dermatophytes comprised Aspergillus spp. (20%), Rhizopus spp. (13%), and Candida spp. (7%). Trichophyton rubrum was the predominant causative agent. These findings indicate that humid working conditions, prolonged farming activities, and poor foot hygiene may increase the risk of fungal nail infections. Improving personal hygiene and using appropriate protective footwear are recommended to reduce the incidence of tinea unguium among farmers.

***Keywords:*** *Trichophyton Rubrum*; *Trichophyton Mentagrophytes*; *Farmers; Dermatophytes; Sabouraud Dextrose Agar.*

## A. INTRODUCTION

Indonesia has a tropical climate with warm temperatures and high humidity, creating conditions that support the growth of various types of fungi, including pathogenic fungi. It is estimated that more than six million Indonesians experience fungal infections each year. The high burden of fungal diseases is a significant concern because it can inform health workers and policymakers in developing strategies for preventing and controlling fungal diseases in Indonesia (Rachmawati et al., 2022).

Tinea unguium is a dermatophyte fungal infection of the nails, belonging to the onychomycosis group. Laboratory examination of Tinea unguium has several main objectives. The examination is carried out to ensure that the nail disorder is truly caused by a dermatophyte fungal infection, and not by other causes such as trauma, psoriasis, or bacterial infection. Identification through direct microscopic examination (KOH) and fungal culture aims to detect the presence of hyphae or causative species. Culture examination aims to determine the dermatophyte species, such as *Trichophyton rubrum* or *Trichophyton mentagrophytes*, *Epidermophyton Fluccosum* so that therapy can be tailored to the characteristics of the pathogen. Accurate diagnosis through laboratory examination helps healthcare professionals determine the rational choice of topical and systemic antifungal therapy and prevents inappropriate medication use (S. Amaliyah, Rahmawati, 2023).

Superficial mycosis is one of the fungal infections commonly encountered in Indonesia. It is a fungal infection that affects the superficial keratinized tissues of the human body, including the epidermis, nails, and hair. *Tinea unguium* is a form of superficial mycosis that specifically infects the nail plate. The incidence of this disease accounts for approximately 30% of all superficial mycoses and around 50% of all nail disorders. Clinically, *tinea unguium* is characterized by nail thickening, nail plate elevation, brittleness, irregular nail surfaces, loss of luster, and discoloration ranging from white and yellow to brown and black. If left untreated,

the infection may lead to pain, unpleasant odor, and brittle nails that serve as portals of entry for pathogenic bacteria, thereby increasing the risk of secondary bacterial infections (Amaliyah & Rahmawati, 2023).

The diagnosis of *tinea unguium* requires a combination of clinical examination and laboratory investigations, including fungal culture on Sabouraud Dextrose Agar (SDA) and direct microscopic examination using potassium hydroxide (KOH). Recent studies have reported an increasing prevalence of onychomycosis caused by non-dermatophyte molds in many tropical countries, including those in Southeast Asia. These findings underscore the importance of accurate fungal identification to ensure appropriate antifungal therapy (Nadifah et al., 2025).

*Tinea unguium* is a dermatophyte infection of the nails that causes nail discoloration, typically appearing white, yellow, or brown, and may be accompanied by onycholysis, nail fissures, and irregular nail surfaces. Although onychomycosis is not a life-threatening condition, it may cause significant medical problems, negatively affect physical appearance, become chronic, and be difficult to treat. Consequently, the disease can substantially impair patient comfort and overall quality of life (Annisa et al., 2025).

Jagalempeni Village, RT 04/RW 04, Wanasari District, Brebes Regency, is an agricultural area where the majority of residents work as active farmers. Frequent exposure to moist environments and repetitive nail microtrauma during agricultural activities places this population at a higher risk of developing fungal nail infections. Therefore, this study aimed to identify the fungal species responsible for *tinea unguium* among the toenails of farmers in Jagalempeni Village through fungal culture examination. Previous studies have also demonstrated an increasing prevalence of *tinea unguium* among agricultural communities. Accordingly, this study focuses on identifying the fungal species causing nail infections among farmers in Jagalempeni Village, RT 04/RW 04, Wanasari District, Brebes Regency.

## B. METHOD

The study employed a descriptive research design with a cross-sectional approach. The study samples consisted of nail scrapings collected from the toenails of 15 farmers residing in Jagalempeni Village, Brebes Regency. Fungal isolation was performed by culturing the specimens on Sabouraud Dextrose Agar (SDA), followed by microscopic examination using Lactophenol Cotton Blue (LPCB) staining for fungal identification. The study was conducted between January and April 2026 at the Microbiology Laboratory of Politeknik Mitra Karya Mandiri.

*Tinea unguium* is a dermatophyte infection of the nail plate characterized by fungal invasion of the keratinized tissue. The infection commonly presents with nail discoloration ranging from white, yellow, and brown to black, accompanied by structural abnormalities such as nail thickening, brittleness, and separation of the nail plate from the nail bed (onycholysis) (Nurdin & Zuchrullah, 2023).

The infection may involve only one or several nails and is strongly associated with occupational and lifestyle-related risk factors. Individuals who work in persistently moist environments, wear closed footwear for prolonged periods, or frequently walk barefoot, thereby exposing their feet directly to contaminated soil, are at an increased risk of developing *tinea unguium*. Such conditions facilitate fungal colonization and subsequent infection of the nail plate (Armiyanti, 2024).

## C. RESULT AND DISCUSSION

The demographic characteristics of the study participants were analyzed to provide an overview of the distribution of respondents according to age and sex before presenting the

findings on the fungal species causing *tinea unguium*. A total of 15 farmers who met the inclusion criteria participated in this study. These demographic characteristics are important because age and sex may influence the risk of developing fungal nail infections, particularly among individuals engaged in agricultural activities involving prolonged exposure to moist environments and repetitive nail trauma. The demographic characteristics of the study participants are presented in Table 1.

**Table 1. Demographic Characteristics of the Study Participants (n = 15)**

| Characteristics | n (%) |
|---|---|
| **Age (Years)** | |
| 40–50 | 10 (66.7%) |
| 50–70 | 5 (33.3%) |
| **Sex** | |
| Male | 11 (73.3%) |
| Female | 4 (26.7%) |

Based on the findings presented in Table 1, most participants were between 40 and 50 years of age, accounting for 10 individuals (66.7%), whereas 5 participants (33.3%) were aged 50–70 years. There were no participants younger than 40 years because individuals in this age group generally worked outside the village or had migrated to other cities for employment. These findings indicate that middle-aged and older adults constitute the majority of the farming workforce in the study area. Increasing age is recognized as an important risk factor for fungal nail infections due to reduced nail growth and regeneration, diminished peripheral blood circulation, and prolonged cumulative exposure to occupational hazards. Among farmers, continuous exposure to moist environments, such as rice fields and wet soil, further promotes fungal growth on the toenails. These findings are consistent with those reported by Khodadadi et al. (2021), who found that individuals aged 45–60 years represented the age group with the highest prevalence of *tinea unguium*.

Individuals aged 25–44 years are generally considered the most economically productive population and may also be at increased risk of developing *tinea unguium* because of excessive perspiration and inadequate personal hygiene associated with occupational activities. In contrast, adults aged 45 years and older are more susceptible to fungal nail infections owing to age-related declines in immune function, reduced physical condition, slower nail growth, and the presence of comorbidities that facilitate fungal colonization. Conversely, *tinea unguium* is relatively uncommon in children because their nails grow more rapidly, provide a smaller surface area for fungal colonization, and are less frequently exposed to repetitive trauma. In the present study, the risk of infection may also have been exacerbated by the long-standing habit of several farmers working barefoot for more than five years, thereby increasing direct contact with fungal contaminants present in the soil.

Regarding sex distribution, the majority of participants were male, comprising 11 individuals (73.3%), while 4 participants (26.7%) were female. The predominance of male participants likely reflects the occupational structure of Jagalempeni Village, Brebes Regency, where agricultural activities are primarily undertaken by men, whereas most women are engaged as homemakers. Male farmers are generally exposed to a greater number of occupational risk factors for fungal nail infections, including prolonged use of closed footwear, frequent contact with soil and mud, and persistent moisture accumulation on the feet during agricultural work. These conditions create a favorable environment for fungal growth and increase the likelihood of developing *tinea unguium* (Iftinan et al., 2025).

**Table 2. Characteristics of Farming Work Duration Among the Study Participants (n = 15)**

| Characteristics | n (%) |
|---|---|
| **Duration of Farming Experience (years)** | |
| 5–10 | 0 (0.0%) |
| >10 | 15 (100.0%) |

Based on Table 2, all respondents had been working as farmers for more than 10 years, accounting for 15 individuals (100.0%), while no respondents had a farming experience of 5–10 years (0.0%). This distribution reflects the demographic profile of the study population, in which the majority of farmers were middle-aged to older adults with extensive occupational experience in agriculture.

These findings indicate that the farmers in Jagalempeni Village had prolonged occupational exposure to agricultural environments. Long-term exposure to moist working conditions, frequent contact with soil, mud, and water, as well as repeated mechanical trauma to the toenails, may increase the risk of developing fungal nail infections. Such environmental conditions provide an ideal setting for fungal growth and facilitate the invasion of the nail plate by pathogenic fungi.

The present findings are consistent with those reported by Rachmawati et al. (2022), who concluded that wet and humid agricultural environments, together with continuous contact with soil, constitute important risk factors for *tinea unguium* among farmers. Similarly, Khasanah et al. (2021) reported that agricultural occupations involving prolonged exposure to moist environments and poor personal hygiene practices significantly increase the risk of developing *tinea unguium*.

**Table 3. Clinical Signs and Symptoms of *Tinea unguium* Among Farmers with Toenail Fungal Infection (n = 15)**

| Clinical Signs and Symptoms | n (%) |
|---|---|
| Yellow nail discoloration | 3 (20.0%) |
| Brown to black nail discoloration | 5 (33.3%) |
| Irregular, thickened, and brittle nails | 7 (46.7%) |

In table 3, Signs and Symptoms, there are different nail color results for each respondent, there are some nail colors that are yellow, blackish brown. Most respondents experienced changes in their nails that were uneven in shape, hardened, and cracked, as many as 7 respondents (47%). In addition, changes in nail color to brown to black were found in 5 respondents (33%) and yellow nails in 3 respondents (20%). Changes in nail texture and color changes were the most dominant symptoms found in the research subjects.

**Table 4. Fungal Species Isolated from Toenail Samples of Farmers with *Tinea unguium* (n = 15)**

| Fungal Species | Culture Characteristics | Positive Samples | n (%) |
|---|---|---|---|
| | Macroscopic Characteristics | Microscopic Characteristics | |
| **Dermatophytes** | | | |
| *Trichophyton rubrum* | Soft colonies with a white to yellowish surface; some isolates exhibited reddish-violet pigmentation on the colony surface. | Smooth-walled, cylindrical macroconidia with abundant spherical microconidia. | S3, S5, S9, S10, S14, S15 |
| *Trichophyton mentagrophytes* | Waxy colonies, white to pale yellow in color, with some isolates showing | Septate and spiral hyphae with abundant spherical microconidia; cigar-shaped | S2, S8, S11 |

| | | | |
|---|---|---|---|
| | reddish-violet pigmentation. | macroconidia were observed. | |
| **Non-dermatophytes** | | | |
| *Aspergillus* spp. | Yellowish-brown to gray colonies with a velvety, granular texture and distinct growth zones. | Septate hyphae with smooth-walled conidiophores. | S1, S7, S12 |
| *Rhizopus* spp. | Cottony colonies, initially white and gradually becoming gray to dark brown or black, with thick colonies spreading rapidly across the culture medium. | Broad aseptate (non-septate) branching hyphae; sporangiophores arising from stolons and terminating in spherical sporangia containing sporangiospores. | S4, S6 |
| *Candida* spp. | Round colonies with smooth, glistening surfaces, creamy white to cream in color, and a soft, yeast-like consistency. | Oval to spherical yeast cells producing pseudohyphae (elongated chains of cells resembling true hyphae) and blastoconidia as vegetative spores. | S13 |

**Figure 1. [A] *Macroscopic characteristics* of Trichophyton rubrum**

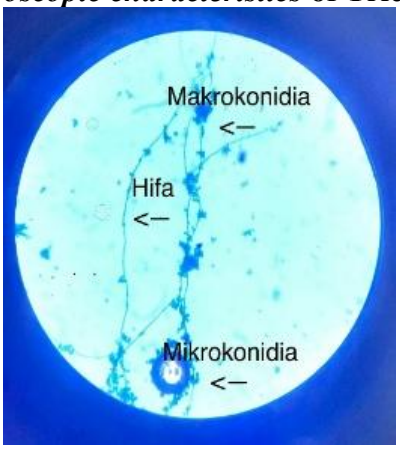


**Figure 2. [B] *Trichophyton rubrum* microscopically (40x)**

Based on research conducted macroscopically, the T.rubrum fungus is characterized by its soft texture, from the front its color is yellowish white (rather light) or can also be violet red

[A]. Microscopically, the T.rubrum fungus is characterized by the presence of smooth-walled, cylindrical macroconidia and produces characteristic round-shaped microconidia [B] (Page et al., 2021).

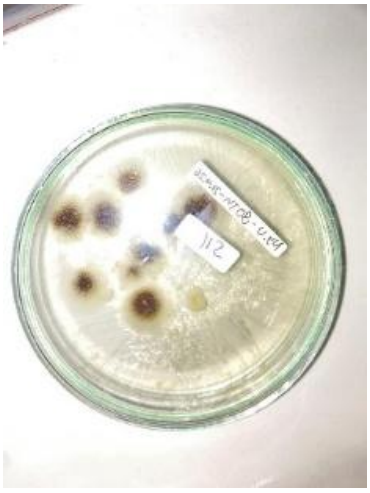

**Figure 3.** [A] ***Trichophyton mentagrophytes*** **microscopically**

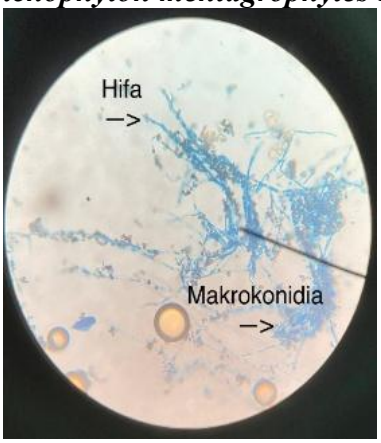


**Figure 4. [B]** ***Trichophyton mentagrophytes*** **microscopically (40x)**

Based on macroscopic research, the fungus T. mentagrophytes is characterized by a waxy coating, white to slightly yellowish white or violet-red. Sometimes it can even be pale yellowish and brown. Its colonies are white to cream-colored with a cotton-like surface [A]. Microscopically, the fungus T. mentagrophytes is characterized by morphological characteristics such as waxy droplets, interpreted as septate and spiral hyphae, small spherical spores, septate mycelium, and cigar-shaped macroconidia [B].

Based on the research conducted, the results of the fungal identification study on the toenails of farmers in Jagalempeni Village, Brebes, showed that 10 people were infected with dermatophyte fungi and 5 people were infected with nondermatophyte fungi. 40% of the infections were caused by Trichophyton rubrum and 20% were caused by Trichophyton mentagrophytes. Trichophyton rubrum is an anthropophilic dermatophyte that causes most infections of human nails and skin. Trichophyton metagrophytes is a zoophilic dermatophyte that can infect both humans and animals. This is in line with a study conducted by Zafindraibe et al. (2021) which found that the majority of dermatophytes infecting patients with tinea unguium were Trichophyton rubrum, followed by Trichophyton mentagrophytes. Similarly, a study conducted at the Dermatology and Venereology Polyclinic at Dr. Ferdinand Lumbantobing General Hospital in Sibolga stated that the main dermatophytes causing tinea unguium were Trichophyton rubrum and Trichophyton mentagrophytes (Apridamayanti, 2021).

Previous studies have also reported a high prevalence of non-dermatophyte fungal infections among agricultural workers. Ahmed et al. (2024) found that 33 (53%) of 100 toenail samples diagnosed with onychomycosis were caused by non-dermatophyte fungi. Similarly, Naqsyabandi (2021) reported that dermatophyte isolates consisted of *Trichophyton rubrum* and *Trichophyton mentagrophytes*, with 9 samples (60%) identified as dermatophytes, including 5 samples (33%) of *T. mentagrophytes* and 4 samples (27%) of *T. rubrum*. Furthermore, studies conducted in Spain have demonstrated an increasing incidence of onychomycosis caused by non-dermatophyte fungi (Nadifah et al., 2025).

In the present study, the predominance of *Aspergillus* spp. may be attributed to the occupational environment of the participants, who routinely worked under humid conditions and had frequent contact with soil, the natural ecological reservoir of this fungus. Inadequate personal hygiene practices, such as failing to wash and dry the feet after work, may further increase the risk of fungal infection. Kamil et al. (2021) reported that farmers who worked barefoot had a significantly greater risk of developing onychomycosis. In addition to *Aspergillus* spp., *Rhizopus* spp. and *Candida* spp. were also isolated from the toenail samples. The presence of *Rhizopus* spp. is likely associated with continuous exposure to soil and moist environments, as this saprophytic fungus is commonly found in soil, decaying organic matter, and wet agricultural settings. The fungus may invade the nail through minor trauma or nail fissures sustained while working barefoot in rice fields. Likewise, *Candida* spp. are opportunistic yeasts that proliferate under warm and humid conditions, such as persistently wet feet.

Farmers whose feet remain immersed in irrigation water for prolonged periods or who do not adequately dry their feet after work create favorable conditions for the growth of *Candida* spp. These fungi may also be transmitted through contaminated soil, water, or agricultural equipment. Moreover, the lack of protective footwear, particularly rubber boots, together with inadequate nail trimming and poor nail hygiene, further increases the risk of *Candida* spp. infection among farmers (Prabandari et al., 2024).

Severe fungal infections among farmers are often associated with poor nail hygiene and occupational environments that favor fungal proliferation, including prolonged exposure to moist soil, wet clothing or footwear, and insufficient protection of the nails during agricultural activities. Zaerani and Zulkarnaini (2021) reported that farmers exposed to soil and high humidity for extended periods are particularly susceptible to severe fungal infections, especially when minor nail trauma or skin lesions provide an entry point for fungal pathogens (Lubis & Nacia, 2025).

The present study demonstrated that 40.0% of fungal nail infections were caused by *Trichophyton rubrum*, whereas 20.0% were attributed to *Trichophyton mentagrophytes*. *Trichophyton rubrum* is an anthropophilic dermatophyte responsible for the majority of dermatophyte infections involving human skin and nails. In contrast, *Trichophyton mentagrophytes* is primarily a zoophilic dermatophyte capable of infecting both humans and animals. These findings are consistent with those reported by Zafindraibe et al. (2021), who identified *T. rubrum* as the predominant dermatophyte causing *tinea unguium*, followed by *T. mentagrophytes*. Likewise, a study conducted at the Dermatology and Venereology Outpatient Clinic of Dr. Ferdinand Lumbantobing General Hospital, Sibolga, reported that *T. rubrum* and *T. mentagrophytes* were the principal etiological agents of *tinea unguium* (Rachmawati et al., n.d.).

Microscopic examination supported the identification of the fungal isolates based on their characteristic morphological features. *Trichophyton mentagrophytes* was identified by the presence of septate and spiral hyphae, abundant spherical microconidia, septate mycelia, and characteristic cigar-shaped macroconidia. *Trichophyton rubrum* was distinguished by smooth-

walled cylindrical macroconidia accompanied by numerous spherical microconidia. *Aspergillus spp.* were identified by septate hyphae with smooth-walled conidiophores terminating in vesicles bearing chains of conidia. *Rhizopus* spp. exhibited broad aseptate branching hyphae with stolons and rhizoids, while upright sporangiophores terminated in spherical sporangia containing sporangiospores. Microconidia serve as asexual reproductive structures that function as infectious propagules during fungal colonization, whereas hyphae are tubular filamentous structures that develop through the germination of conidia or spores and constitute the vegetative body of filamentous fungi (Mushlih, 2025).

A study entitled *Prevalence of Onychomycosis Among Fish Vendors at Kopro Market, West Jakarta* also reported the isolation of non-dermatophyte fungi from nail scrapings. *Candida albicans* was identified as the most frequently isolated species, followed by *Aspergillus niger* and *Aspergillus flavus*. These findings further support the role of non-dermatophyte fungi as important etiological agents of nail infections (Amaliyah & Rahmawati, 2023).

In addition, Hajar et al. (2022) demonstrated that poor personal hygiene and the use of socks made from non-breathable materials were significantly associated with an increased risk of fungal infection. Therefore, maintaining proper personal hygiene and keeping the skin dry, particularly in areas prone to perspiration such as skin folds, the feet, and the interdigital spaces, are essential preventive measures. Wearing clean, dry, and moisture-absorbing clothing, together with avoiding the sharing of personal items such as towels and footwear, may further reduce the risk of fungal transmission (Salsabilla & Bedah, 2025).

## D. CONCLUSION

Based on the examination of 15 toenail samples collected from farmers in Jagalempeni Village, Brebes Regency, two dermatophyte species were identified: *Trichophyton rubrum* (40.0%) and *Trichophyton mentagrophytes* (20.0%). In addition, three non-dermatophyte fungi were isolated, namely *Aspergillus* spp. (20.0%), *Rhizopus* spp. (13.3%), and *Candida* spp. (6.7%). Among all fungal isolates, *Trichophyton rubrum* was the most frequently identified species, accounting for 40.0% of the positive samples. The findings of this study emphasize the importance of preventative measures, such as wearing appropriate footwear, maintaining foot hygiene, and raising farmers' awareness of the risks of fungal infections. Farmers can reduce tinea unguium cases by receiving training in personal hygiene and safe work practices.

## REFERENCES

Alyatul Himma, Mufida, D. C., Sofiana, K. D., Armiyanti, Y., & A. D. (2024). The relationship between personal hygiene and the prevalence of *tinea unguium* infection among farmers in Jember District. *Jurnal Profesi Medika: Jurnal Kedokteran dan Kesehatan, 18*(1), 44–50.

Amaliyah, S., & Rahmawati, A. (2023). Karakteristik jamur penyebab *tinea unguium* pada pedagang ikan. *Jurnal Poltekkesmu, 8*, 20–25.

Annisa, I., Zahra, M. A., & Prihati, M. (2025). Fungi dermatofita pada kuku kaki petani di Desa Sumurbandung Kabupaten Lebak. *Journal of Medical Laboratory, 3*(1), 33–37.

Apridamayanti, A. G. A. R. S. P. (2021). Uji karakteristik makroskopik jamur dermatofita yang terdapat pada ulkus diabetikum derajat III dan IV Wagner. *Jurnal Farmasi Kalbar, 4*(1), 11.

Iftinan, K., Raharjo, A. M., Agustina, D., & Mufida, D. C. (2025). Personal protective footwear and the risk of *tinea unguium* among Lojejer villager farmers. *Indonesian Journal of Occupational Safety and Health, 14*(2), 222–229. https://doi.org/10.20473/ijosh.v14i2.2025.222-229

Khasanah, M., Marsudi, L. O., & Penelitian, M. (2021). Studi literature agen dan faktor risiko penyebab *tinea unguium* pada infeksi kuku kaki petani. *Jurnal Teknologi Laboratorium Medik Borneo, 1*(1), 34–41.

Khodadadi, H., Zomorodian, K., Nouraei, H., Zareshahrabadi, Z., Barzegar, S., Reza, M., & Keyvan, Z. (2021). Prevalence of superficial cutaneous fungal infections in Shiraz, Iran: A five-year retrospective study (2015–2019). *Journal of Clinical Laboratory Analysis*. https://doi.org/10.1002/jcla.23850

Lubis, S. S., & Nacia, A. A. (2025). Description of *tinea unguium* infection levels in farmers' nails in Meunasah Pupu Village, Ulim District, Pidie Jaya Regency. *International Journal of Science, Technology and Applications, 3*(1), 12–24.

Mushlih, M. (2025). Dermatophyte fungi causing *tinea unguium* in toenails of builders in Bangkalan. *Indonesian Journal on Health Science and Medicine*, 1–11.

Nadifah, F., Muhajir, N. F., Sanusi, K. E., Nuryati, A., & Murtiningrum, S. (2025). Identifikasi jamur penyebab *tinea unguium* pada kuku kaki petani di Dusun Baros, Tirtohargo, Kretek, Bantul. *Jurnal Biosense, 8*(3).

Nurdin, E., Zuchrullah, M., & M. A. N. I. (2023). Deteksi jamur dermatofit dan non-dermatofit pada *tinea unguium* menggunakan media alternatif sukun dextrose agar. *Jurnal Inovasi Pendidikan dan Sains, 4*(1), 16–20.

Page, J. H., Sebayang, R., & Kurniawan, I. (2021). Perbedaan jumlah koloni jamur *Trichophyton rubrum* pada media *Sabouraud Dextrose Agar* dan modifikasi glukosa 3 g. *Jurnal Penelitian Sains, 23*(3), 134–139.

Prabandari, A. S., Pramonodjati, F., & Sari, A. N. (2024). Isolasi dan identifikasi jamur penyebab onikomikosis pada petani di Kabupaten Sukoharjo, Jawa Tengah. *Indonesian Journal on Medical Science, 11*(1).

Rachmawati, F., Nursidika, P., & Fitrianingsih, P. (n.d.). Identifikasi jamur *Trichophyton* sp. penyebab *tinea unguium* pada petani di Desa Mekarluyu, Kabupaten Garut. *Jurnal Penelitian Saintek, 27*(2), 112–118.

Salsabilla, D. P., Bedah, S., & P. E. (2025). Epidemiologi infeksi jamur: Kasus *tinea pedis* di kalangan pencuci jasa kendaraan bermotor. *Jurnal Fatmawati Laboratory & Medical Science, 5*(1), 25–37.