IJSTA
International Journal of Science, Technology and Applications
ISSN Elektronik: 3024-9228
https://ejournal.ahs-edu.org/index.php/ijsta/about
Published by Alpatih Harapan Semesta

Description of Tinea Unguium Infection Levels in Farmers' Nails in Meunasah Pupu Village, Ulim District, Pidie Jaya Regency

[1]Syafrina Sari Lubis*, [1]A'Arifa Nacia
[1]Biology Study Program, Faculty of Science and Technology, UIN Ar-Raniry Banda Aceh

*Korespondensi: syafrinasarilbs@ar-raniry.ac.id

DOI: https://doi.org/10.70115/ijsta.v3i1.270

Article Info

Article history:
Received : Sept 26, 2025
Revised : Okt 19, 2025
Accepted : Nov 1, 2025
Published: Nov 10, 2025

Keywords:
Farmer's Nails, *Tinea unguium*, Infection Rates

ABSTRACT

Tinea unguium infection is a fungal infection that attacks the nails characterized by cracks and the color of the nails changing to reddish brown, and yellowish. Tinea unguium occurs with a general condition that begins with spots or yellow on the toenails. Severe fungal infections can cause nails to blacken, thicken, and crumble at the edges. This infection can affect several nails but usually not all nails are infected. If the fungal infection on the nails is still relatively mild, it does not require treatment. Fungal nail infections can cause pain and thickening of the nails so that they require care and treatment. This study aims to identify the type of fungus that causes Tinea unguium in the nails of farmers in Meunasah Pupu Village, Ulim District, Pidie Jaya Regency. The method of taking samples of farmers' nails was carried out descriptively by conducting direct interviews. The sample involved 20 respondents who had nail damage. Nail scraping samples were grown on PDA media and incubated for 3-7 days at a temperature of 25 ºC. Based on the characterization, 23 isolates were obtained, namely Trycophyton rubrum (SB1), Trycophyton mentagrophyts (SC1), Epidermophyton floccosum (SG1, SH1, ST1), and Aspergillus sp.

INTRODUCTION

Fungal infections that are often found in Indonesia are mycosis. *Mycosis* is divided into two, deep mycosis and superficial mycosis. Deep mycosis attacks internal organs while superficial mycosis attacks the epidermis or outer layer such as nails (Nurfadila & Hermansyah, 2021). This infection is divided into two groups, namely infections caused by dermatophyte fungi and non-dermatophyte fungi. Dermatophytes are a group of fungi that have the property of being able to digest keratin, for example the stratum corneum of the skin (epidermis), hair, nails and cause dermatophytosis. Dermatophytes are divided into three genera, namely *Trichophyton, Microsporum* and *Epidermophyton* as the main triggers of *Dermatophytosis* (Nurhidayah, 2021).

Dermatophyte fungi are fungi that can cause *Tinea unguium* disease (Nurfadhilah, 2021). This disease is a disease that begins with the appearance of yellow spots on the tips of the fingernails or toenails. Dermatophytosis infections often attack farmers who work in rice fields or fields (Nurfadilah et al., 2021). Feet come into contact with soil, water and mud for a long time without wearing footwear to protect their feet from soil, water and mud so that farmers' feet are damp and farmers rarely pay attention to personal hygiene after work (Anggraini & Fahmi, 2022). If left untreated, this disease will cause nails to turn black and thicken, become brittle and crumble at the edges and cause an unpleasant odor. Brittle nails can allow pathogenic bacteria to enter which can cause other infections (Nurhidayah, 2021). Research by Latifah & Sulistiawan (2019) showed that Tinea unguium on the toenails of oil palm farmers in Pauh Menang Village was caused by Dermatophyta fungi, especially Trichophyton rubrum. Rachmawati et al., (2022) showed that 23% of respondents who experienced *Tinea unguium* symptoms were infected by the Trichophyton sp. fungus. From the analysis results, the fungal species found were *Trichophyton rubrum* at 17% and *Trichophyton mentagrophytes* at 6%.

Based on the description above, the researcher is interested in conducting a study entitled "Description of *Tinea unguium* Infection Levels on Farmers' Nails in Meunasah Pupu Village, Ulim District, Pidie Jaya Regency".

METHOD

The study was conducted using a descriptive laboratory observation method, namely by conducting laboratory tests to identify the presence of fungi in 20 samples of female farmers' thumb nails in Meunasah Pupu Village, Ulim District, Pidie Jaya Regency. Nail scraping samples were cultured on Potato Dextrose Agar (PDA) media by applying them to the center of the media. After that, they were wrapped in wrap paper and incubated at a temperature of 25 ºC for 7 days. Once a day, it was checked for fungal growth, if there was no fungal growth for more than two weeks, the results were said to be negative. If the fungus grows, macroscopic identification and characterization are carried out (Aprilia, 2022). Identification of fungi by macro and micro morphology using the concept of Superficial Fungal Infections (Charisma, 2019).

Identification of fungi was carried out macroscopically and microscopically. Macroscopic observations can be carried out to identify fungal colonies that grow on Potato Dextrose Agar (PDA) media (Fahmi et al., 2021). Morphological characteristics can be seen in the color and surface of the colony, radial lines from the center of the colony towards the edge of the colony, and concentric circles. Identification of fungi morphologically uses the concept of Superficial Fungal Infections (Charisma, 2019). Microscopic observation aims to determine cell recognition fragments (cell shape, cell wall thickening, and others), cell contents (starch, calcium oxalate crystals, and so on), and the shape of cells or typical tissues of the simplicia

(Novitasari, 2021). Tinea unguium or fungal nails have several levels of severity which are generally assessed based on how many nails are infected, how severe the infection is and how severe the infection has penetrated the nails. General criteria include the level of infection, depth of infection, and additional symptoms. This level of infection usually occurs in one infected nail or several nails, and how severe the infection is in each nail. The depth of this infection indicates how deeply the fungus has penetrated the nails, such as only on the surface or has reached a deeper layer. Meanwhile, additional symptoms include changes in nail color, changes in nail shape or pain around the nails (Aprilia & Farizah, 2022).

RESULTS AND DISCUSSION

The results of the examination of the nails of farmers in Meunasah Pupu Village, Ulim District, Pidie Jaya Regency obtained data on age, gender, and characteristics of nail damage experienced by several.

Table 1 Results of fungal examination of toenail scrapings of farmers in Meunasah Pupu Village, Ulim District, Pidie Jaya Regency

No	Sample code	Age (Years)	Characteristics of Nail Damage Experienced
1	S1	42	Brownish nails
2	S2	45	Nails are white, yellowish, brown or reddish
3	S3	44	Reddish brown nails
4	S4	50	The nails are pale yellow and have spots Kirim masukan
5	S5	41	Pale yellow nails are a sign of damage.
6	S6	47	Pale creamy white nails
7	S7	40	Pale creamy white nails
8.	S8	45	Light brownish nails
9	S9	42	Light brownish nails
10	S10	43	Yellowish creamy white nails
11	S11	45	Nails are pale yellowish brownish
12	S12	52	Nails are creamy yellowish
13	S13	53	Nails are pale yellow with signs of damage
14	S14	50	Nails are pale yellow
15	S15	45	Nails are brownish yellow
16	S16	55	Nails are yellowish white
17	S17	48	Nails are pale yellowish white
18	S18	49	Nails are pale yellow and have some damage
19	S19	49	Nails are yellow and have black dirt
20	S20	50	Nails are greenish to light brown

Examination of toenail scrapings from farmers in Meunasah Pupu Village, Ulim District, Pidie Jaya Regency showed variations in the characteristics of symptoms of damage

to farmers' toenails in Meunasah Pupu Village, Ulim District, Pidie Jaya Regency. The samples showed changes in nail color, such as white, yellowish, brownish, to greenish, which could indicate fungal infections. Some nails experienced discoloration accompanied by physical damage or dirt, while others appeared healthy with a clean white color. The variation in age of the samples examined showed that nail damage was not limited to a certain age group, but environmental factors and daily activities such as farming could be the main causes of exposure to nail fungus.

The most common fungi found in cases of nail damage in farmers were Trychophyton rubrum, Trychophyton mentagrophytes, and Epidermophyton floccosum and Asprgillus sp. These infections cause symptoms in the nails, including changes in nail color to brownish, yellowish, or greenish, as well as damage to the nail structure. This study shows that Trychophyton rubrum is the dominant cause of infection, seen in sample S2 which experienced a change in nail color to yellowish white to reddish. These results are in accordance with the research of Mandiri et al., (2024) which stated that Trichophyton rubrum has macroscopic characteristics in the form of slightly raised or flat colonies, with a cream to white color. The colonies have a soft texture resembling cotton with a smooth surface, and the back produces yellow to reddish pigments.

The results of the study found that *Epidermophyton floccosum* infection was found in samples S8, S9, S20 with symptoms of nails turning light brown. This study is in accordance with Fadillah (2021), stating that *Epidermophyton floccosum* shows a spreading colony shape, with a light brown color and a velvety texture. One of the main causes of nail fungus infections in farmers is environmental conditions, such as working in damp rice fields and close to soil and water (Munadhifah, 2020). Dermatophyte fungal infections such as *Epidermophyton floccosum* and *Trichophyton* can thrive in humid and warm environments, where these conditions are very often encountered by farmers working in rice fields (Mahajan, 2020). Based on age factors, it shows that the 45 and 50 year old age groups have a higher incidence rate than other age groups. Previous research by Nurbidayah et al., (2019), stated that nail fungus infections tend to be more common in adults, especially adults who are less aware of hygiene, in addition, factors such as a weakened immune system and higher exposure to fungal pathogens. Thus, age is an important factor in assessing the risk of *Tinea unguium* infection. The results of the study on the types of fungi found in farmers' toenail scrapings are *Aspergillus* sp., *Tricophyton rubrum, Tricophyton mentagrophytes,* and *Epidermophyton floccosum.* The study showed that out of 20 samples of farmers' toenail scrapings in Meunasah Pupu Village, the most dominant type of fungus was Aspergillus sp. with a frequency of 17 isolates, found in the sample code (S1, S2, S3, S4, S5, S6, S7, S8, S10, S11, S12, S13, S14, S15, S16, 217, S18, S19). In addition, *Epidermophyton floccosum* was found in 3 isolates (S8, S9, S20), followed by *Trychophyton rubrum* in 1 isolate (S2) and *Trychophyton mentagrophytes* in isolate (S3). This study shows that farmers' toenails in the area are exposed to various types of fungi, with a dominance of *non-dermatophyte fungi.*

Table 2. Number of fungi found in toenail scrapings from farmers in Meunasah Pupu Village, Ulim District, Pidie Jaya Regency.

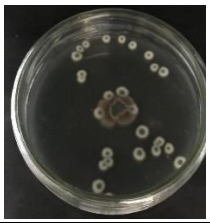
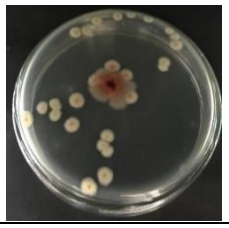
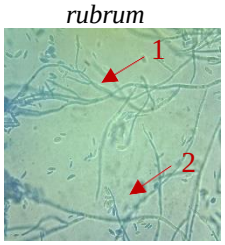
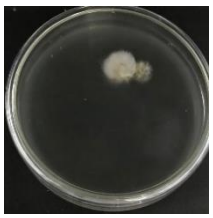
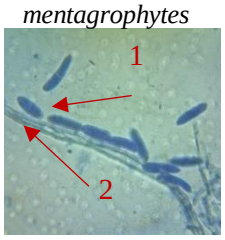
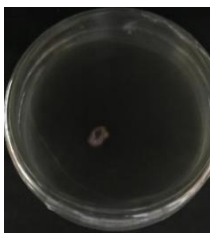
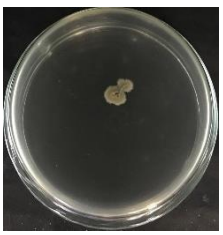
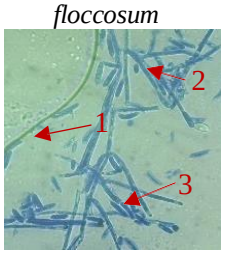
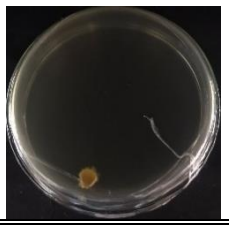
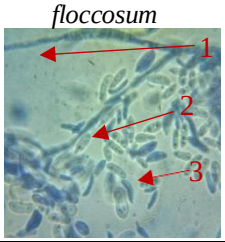
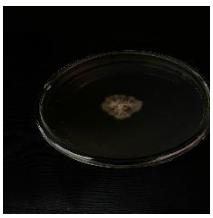
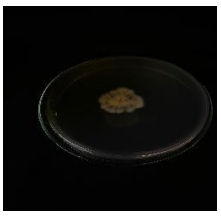
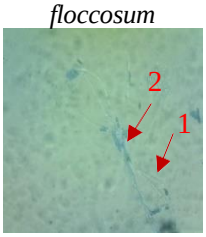
Spesies of Fungi	Count	Sample Code
Trychophyton rubrum	1	S2
Trychophyton mentagrophytes	1	S3

Epidermophyton floccosum	3	S8, S9, S20
Aspergillus Sp	17	S1, S4, S5, S6, S8, S10, S11, S12, S13, S14, S15, S16, 217, S18, S19
Total	**23**	

The study showed that from 20 samples of toenail scrapings from farmers in Meunasah Pupu Village, Ulim District, Pidie Jaya Regency, four types of fungi were found with varying frequencies. *Aspergillus* sp. is the most dominant type with 17 samples (S1, S2, S3, S4, S5, S6, S7, S8, S10, S11, S12, S13, S14, S15, S16, S17, S18, S19). Epidermophyton floccosum was found in 3 samples (S8, S9, S20), while Trychophyton rubrum and Trychophyton mentagrophytes were each found in 1 sample (S2 and S3). This study shows the diversity of dermatophyte and non-dermatophyte fungi in the toenails of rice farmers in the area. The morphology of nail scraping fungus causing Tinea unguium on farmers' nails in Meunasah Pupu Village, Ulim District, Pidie Jaya Regency includes macroscopic observations, such as color, texture, and colony shape, as well as microscopic observations that include hyphae characteristics, conidia shape, and conidiophore shape.

The morphology of fungi in toenail scrapings of farmers in Meunasah Pupu Village, Ulim District, Pidie Jaya Regency, showed various characteristics both macroscopically and microscopically. In isolate (SB1), the fungal colony appeared greenish white at the front and creamy red at the back, with a cottony texture and irregular shape; microscopically it showed septate hyphae with septate elliptical conidia and branched conidiophores. Isolate (SC2) had white colonies on both sides, textured. Isolate (SH1) showed greenish cream and cream, cottony textured and irregular, with septate hyphae, septate elliptical conidia, and branched conidiophores. In isolate (SI1), the colony was creamy white at the front and brownish cream at the back, cottony textured and irregular, had non-septate hyphae and single conidiophores. Isolate (ST1) showed a white cream color at the front and yellow cream at the back, had a cottony texture, was irregular, and had septate hyphae with septate elliptical conidia and branched conidiophores.

Table 4. Fungi that cause Tinea unguium in farmers in Meunasah Pupu Village, Ulim District, Pidie Jaya Regency

No	Isolate code	Macroscopis		Microscopis	Describe
		Front	Reverse		
1	SB1			*Trychophyton rubrum* 	1. Hyphae 2. Microconidia
2	SC1			*Trychophyton mentagrophytes* 	1. Hyphae 2. Microconidia
3	SG1			*Epidermophyton floccosum* 	1. Hyphae 2. Microconidia 3. Macroconidia
4	SH1			*Epidermophyton floccosum* 	1. Hyphae 2. Microconidia 3. Macroconidia
5	ST1			*Epidermophyton floccosum* 	1. Hyphae 2. Macrokonidia

Fungi causing Tinea unguium in farmers in Meunasah Pupu Village, Ulim District, Pidie Jaya Regency were identified as 3 fungi, namely Trichophyton rubrum (SB1), Trichophyton mentagrophytes (SG1 and SH1), and Epidermophyton floccosum (ST1). Tinea unguium infection, or better known as onychomycosis, is a fungal infection that affects the nails and can have a significant impact on the health and productivity of farmers. This study aims to evaluate the level of tinea unguium infection in farmers' nails in Meunasah Pupu Village, Ulim District, Pidie Jaya Regency. The image of the severity of Tinea unguium infection in Farmers' Nails (Figure 2).

(a) (b) (c)

Figure 2 (a) Severe Level; (b) Medium Level; (c) Light Level

Tinea unguium is a common health problem among farmers due to high exposure to humid conditions and dirt. The level of infection can vary, with symptoms indicating the severity of the infection. In severe infection (S2), the nails will show a striking color change, such as white, yellowish, brown, or reddish, often accompanied by thickening and damage to the nails. Moderate infection (S4) is characterized by light brownish nails. Meanwhile, in mild infection (S12), the nails will appear pure white, indicating that the infection is still in the early stages and can be managed with proper treatment. This study is in line with the study by Nurfadilah, (2021) in Pidie Jaya which identified specific types of fungi that cause infection, namely Trychophyton rubrum, Trychophyton mentagrophytes, and Epidermophyton floccosum.

In addition, the study is also in line with research on toenail samples of tofu and oncom factory workers in the Swakerta Small Industry Settlement, Kalideres, West Jakarta, it was found that most of the samples were infected by dermatophyte fungi, namely Trichophyton rebrum, Trichophyton mentagrophytes, and Trichophyton sp. In addition, research by Artha & Oktasaputri (2020) detected 1 dermatophyte fungus, namely Trichophyton rubrum and non-dermatophytes, namely Candida albicans and Aspergillus niger in tinea unguium infections of toenails of cleaners in the area around Jalan Abd. Kadir, Makassar City. Meanwhile, research by Purba et al., (2021), Tinea unguium infection in toenails of farmers in Blang Panas Village showed that farmers were infected with dermatophyte fungi, namely Trichophyton mentagrophytes and Epidermophyton floccosum, and there were types of contaminant fungi, namely Aspergillus niger and Penicillium sp.

Fungi from the genus Aspergillus sp., and Alternaria sp., are often found in the environment and can contribute to nail infections although they are not the main cause of Tinea unguium. Aspergillus sp., is a fungus that is commonly found in soil and decaying organic matter, and thrives in humid environments, such as agricultural areas. This saprophytic fungus is commonly found in the air and soil, so it is often the cause of contamination. Aspergillus sp., can infect between the toes and the soles of the feet by directly invading the superficial layer of the skin plate of the foot (Hasan et al., 2020).

Latifah & Sulistiwan (2019) revealed that Aspergillus sp., is a contaminant fungus that can be found anywhere. This fungus can spread through spores that are abundant in the air. Humid and poor environmental conditions can affect the presence of these fungi, so that their spores can be carried by the air and stick to the nails. The infections that occur vary, where there are samples infected by one species of fungus, and there are also those infected by two species of fungi.

Aspergillus sp., is a fungus commonly found in soil and decaying organic matter, and thrives in humid environments, such as agricultural areas. This saprophytic fungus is commonly found in the air and soil, so it is often the cause of contamination. Aspergillus sp,. can infect between the toes and the soles of the feet by directly invading the superficial layer of the skin plate of the feet (Hasan et al., 2020).

In a study by Prabandari et al., (2024), the non-dermatophyte fungus Aspergillus niger was identified by characteristics such as large round conidia and dark brown to black conidiophores, while Aspergillus fumigatus was identified by its egg-shaped vesicles and smooth conidiophores. In the work of rice farmers, environmental factors such as working in wet rice fields and direct exposure to soil and water can be one of the main causes of fungal infections of the nails (Munadhifah, 2020). Dermatophyte fungal infections such as Epidermophyton floccosum and Trichophyton can thrive in humid and warm environments, which are very common among rice farmers working in the fields (Mahajan, 2020). According to Firmansyah et al., (2021), fungal nail infections can have an impact on the health and productivity of farmers, considering that infected nails can interfere with daily activities. Nail fungus in farmers in Meunasah Pupu Village showed variations in macroscopic characteristics of colonies that reflected the diversity of fungal species. Of the five isolates observed, namely Trichophyton rubrum (SB1), Aspergillus sp. (S2), Trychophyton mentagrophytes (SC1), Epidermophyton floccosum (SG1, SH1 and ST1), differences in color, texture, and shape of the colonies can be seen. Trichophyton rubrum (SB1) colonies are greenish white with a reddish cream texture. According to the research results of Waji & Debit (2022), Trichophyton rubrum has a white colony with a maroon center and a fibrous colony texture. In addition, Mandiri et al., (2024) also stated that Trichophyton rubrum has macroscopic characteristics in the form of slightly raised or flat colonies, with a cream to white color. The colony has a soft texture resembling cotton with a smooth surface, and the back produces yellow to reddish pigments. Also in accordance with the research results of Waji & Debit (2022), Trichophyton rubrum has a white colony with a maroon center and a fibrous colony texture.

Trichophyton mentagrophytes in isolate SC1 is white with irregular characteristics and a cotton-like shape according to the research of Endrawati et al., (2021) which shows a cotton-like and irregular shape. Isolates from Epidermophyton floccosum (SG1, SH1, and ST1) show varying cream colors, adding to the existing diversity. This study is in accordance with the research of Nurfadillah (2019), stating that macroscopic results on the growth of fungal colonies with Epidermophyton floccosum samples show a spreading colony shape, with a light brown color and a velvet-like texture. The morphology of nail fungus in farmers in Meunasah Pupu Village observed microscopically shows variations in the characteristics of hyphae, conidia, and conidiophores from the five isolates observed, namely Trychophyton rubrum (SB1), Trychophyton mentagrophytes (SC1), Epidermophyton floccosum (SG1, SH1, ST1). Hyphae in isolates Trychophyton rubrum (SB1) and Epidermophyton floccosum (SG1, ST1) are septate, while isolates Trychophyton mentagrophytes (SC1) and one isolate Epidermophyton floccosum (SH1) are not septate. All isolates showed elliptical and septate conidia, but the shape of the conidiophores varied; most isolates had branched conidiophores, except for isolate Epidermophyton floccosum (SH1) which showed a single conidiophore.

This study is in line with Trina et al., (2021), stating that Trychophyton rubrum and Trychophyton mentagrophytes are often found in dermatophytosis infections, especially on nails, with morphological characteristics of septate hyphae and branched conidiophores in some species. Research on the symptoms and characteristics of nail damage caused by the Trychophyton rubrum fungus seen in sample S2 which experienced a change in nail color to yellowish white to reddish indicating a severe level. These results are in accordance with research by Anggowarsito et al., (2018) which revealed that nail discoloration is the main symptom of Tinea unguium infection. This change in nail color occurs because the fungus attacks the nail layer, causing damage to the structure and function of the nail which results in the deposition of substances that change its color. Infections that are not treated immediately can cause more serious damage, including nails that fall off or break.

Factors causing severe infections in farmers are often related to poor habits in maintaining nail hygiene and environmental conditions that support fungal growth, such as damp soil, wet clothes or footwear, and lack of nail protection while working. Research by Zaerani & Zulkarnaini (2021) states that farmers who are exposed to soil and high humidity for a long time are very susceptible to more severe fungal infections, especially if the nails have been scratched or there are wounds that allow the fungus to enter.

In addition, nails that show a pale yellow color and dirt, such as in sample S4, are categorized as moderate infection. Research conducted by Herdiana et al., (2020) supports this by stating that symptoms of nail damage, including dirt and abnormal discoloration, are often indicators of fungal infection. Infection at this stage is easier to identify, but can be treated with topical or oral medication if diagnosed early. However, farmers who work in humid and soil-contaminated environments are more susceptible to infections that develop more quickly, especially if nails are frequently exposed to water or chemicals.

The causative factors of infection in farmers in this category often involve exposure to humid conditions and soil dirt, which can increase the likelihood of fungus growing. Renyaan (2020) stated that poor nail hygiene, such as not cutting nails regularly or wearing damp shoes, can increase the risk of infection at this level.

As for mild infections (S10), they are characterized by pale white nails. Munadhifah (2020) stated that regular nail cutting and maintaining nail hygiene are important steps to prevent or avoid fungal nail infections. Clean and healthy nails tend to have natural protection against fungal infections. This can be achieved through good living habits, such as maintaining nail hygiene, wearing appropriate shoes, and avoiding damp conditions that support fungal growth. Poor personal hygiene, such as wearing wet shoes for long periods of time or not washing hands after outdoor activities, also plays a major role in the spread of infection. Manik et al., (2024) stated that farmers who are continuously exposed to soil and water are more susceptible to fungal infections if they do not maintain good hygiene. Infected nails are often difficult to recover without proper treatment, and farmers who have a less hygienic lifestyle are more likely to experience more severe complications.

CONCLUSION

Based on 20 samples that have been analyzed, 3 types of dermatophyte fungi that cause Tinea unguium were found, namely Trichophyton rubrum, Trychophyton mentagrophytes and Epidermophyton floccosum. In addition, there are types of non-dermatophyte fungi, namely Aspergillus sp. The level of Tinea unguium infection in farmers' nails in Meunasah Pupu Village, Ulim District, Pidie Jaya Regency showed variations in the condition of the respondents' nails. Of the 20 samples tested, most of the farmers' nails had severe infections,

with nails that were pale white, yellowish, brown, or reddish, and some nails that were light brownish. infections in the moderate and mild categories.

BIBLIOGRAPHY

Amalia, A. U. (2020). Karakteristik Penderita Dermatofitosis di Beberapa Rumah Sakit di Wilayah Indonesia Periode Tahun 2012 Sampai dengan Tahun 2018 (Doctoral Dissertation, Universitas Bosowa). Link: https://repository.unibos.ac.id/xmlui/handle/123456789/1739. Diakses 15 Mei 2023.

Anggowarsito, J. L. (2018). Kuku Sebagai Petunjuk Penyakit Lain (Nail As A Hint Other Diseases). Kuku Sebagai Petunjuk Penyakit Lain (Nail As A Hint Other Diseases), 4(2), 134-142.

Anggraini, D. A., & Fahmi, N. F. (2022). Pencegahan Penyakit Sistemik pada Infeksi Tinea unguium Kuku Petani Desa Tragah Kabupaten Bangkalan. Jurnal Paradigma (Pemberdayaan & Pengabdian kepada Masyarakat), 4(2),14-19.e-ISSN 2807-923X. Link: https://stikes-nhm.e-journal.id/PGM/ article/view/735.

Anusha, L. (2020). Clinico-Mycological Study Of Dermatophytosis At A Tertiary Care Hospital (Doctoral Dissertation, BLDE (Deemed to be University)). Link: https://digitallibrary.bldedu.ac.in/handle/123456789/4225. Diakses 18 Mei 2023.

Arizandy, R., Rahmawati, Y. T., & Sandhi, T. A. N. (2023). Analisis Faktor Risiko Tinea Pedis pada Pengguna Sepatu Boots. CoMPHI Journal: Community Medicine and Public Health of Indonesia Journal, 4(1).

Artha, D., & Oktasaputri, L. (2020). Identifikasi jamur dermatofita pada infeksi tinea unguium kuku kaki petugas kebersihan di daerah sekitar jalan abd. kadir kota Makassar. Jurnal Media Laboran, 10(1), 43-47.

Atsila, F. A. (2024). Hubungan Penggunaan Kaos Kaki Terhadap Tinea Pedis pada Personil Satuan Kerja Sabhara Polres Belawan (Doctoral dissertation, Fakultas Kedokteran, Universitas Islam Sumatera Utara).

Begum, J., Mir, N. A., Lingaraju, M. C., Buyamayum, B., & Dev, K. (2020). Recent Advances in The Diagnosis of Dermatophytosis. Journal of Basic Microbiology, 60(4), 293-303. DOI: https://doi.org/10.1002/jobm.201900675.

Charisma, A.M. (2019). Buku Ajar Mikologi. Surabaya: Airlangga University Press. https://books.google.com/books/about/Buku_Ajar_Mikologi.html?hl=id&id=lCGwDwAAQBAJ#v=onepage&q&f=false.Diakses pada tanggal 23 Juni 2024.

Fahmi, N. F., Anggraini, D. A., & Abror, Y. K. (2021). Pola Infeksi Jamur Kuku (Onikomikosis) Jari Tangan dan Kaki Pada Pekerja Tempat Penitipan Hewan Pada Media Potato Dextrose Agar (PDA). Jurnal Ilmu Kesehatan Bhakti Husada: Health Sciences Journal, 12(2), 107-123. e-ISSN 2623-1204. DOI: https://doi.org/10.34305/jikbh.v12i2.324.

Firmansyah, Y. W., Widiyantoro, W., Fuadi, M. F., Afrina, Y., & Hardiyanto, A. (2021). Dampak Pencemaran Sungai di Indonesia Terhadap Gangguan Kesehatan: Literature Review. Jurnal Riset Kesehatan Poltekkes Depkes Bandung, 13(1), 120-133.

Fonna, T. R., & Haura, J. (2023). Gambaran Klinis Pada Penderita Tinea unguium, Penyuluhan di Puskesmas Syamtalira Bayu, Aceh Utara. Auxilium: Jurnal Pengabdian Kesehatan, 1(1), 6-10. e-ISSN 3026-2720. DOI: https://doi.org/10.29103/auxilium.v1i1.12610.

Haerani, H., & Zulkarnain, Z. (2021, November). Tinea Pedis. In Prosiding Seminar Nasional Biologi (Vol. 7, No. 1, pp. 59-64).

Hamudyah, F. H., Puspitorini, A., Kusstianti, N., & Windayani, N. R. (2021). Perbandingan Hasil Penggunaan Nail Gel Pada Kuku Asli dan Kuku Palsu Motif Leopard. Journal Beauty and Cosmetology, 3(1), 3138.e- ISSN: 2963-0703. DOI. https://Doi.Org/10.31965/Jkp.

Hasan, Z. A., Adawiyah, R., Naim, N., & Armah, Z. (2022). Identifikasi Jamur Penyebab Onychomycosis Pada Kerokan Kuku Pekerja Bangunan. Lontara: Journal of Health Science and Technology, 3(1), 38- 49.

Hasanah, D. M. (2021). Identifikasi Jamur Pada Kuku Kaki Petani di Desa Moara Kecamatan Klampis (Doctoral dissertation, STIKes Ngudia Husada Madura).

Herdiana, E., Saniah, L., & Reyta, F. (2022). Deteksi Jenis Penyakit melalui Perubahan Warna Kuku dengan Teknik Image Processing. Jurnal Accounting Information System (AIMS), 5(1), 81-92. https://doi.org/10.1111/1346-8138.15060

Juwita, S. S., Trisnawati, N. L. P., & Suyanto, H. (2021). Characterization of Human Nails Samples Using FTIR (Fourier Transform Infrared) Through Chemometric Methods PCA and Clustering. Buletin Fisika, 22(2), 84-90. DOI: https://doi.org/10.24843/BF.2021.v22.i02.p05.

Latifah, I., & Sulistiawan, N. (2019). Identifikasi Jamur Dermatophyta Penyebab Tinea unguium Pada Kuku Kaki Petani Kelapa Sawit Berdasarkan Penggunaan Alas Kaki di Desa Pauh Menang Kecamatan Pamenang Kabupaten Merangin, Jambi. Anakes: Jurnal Ilmiah Analis Kesehatan, 5(2),189-197. p-ISSN 2088-5687. DOI: https://doi.org/10.3701 2/anakes.v5i2.347.

Mandiri, M. P., Sasongkowati, R., & Anggraini, A. D. (2024). Analisa Keberadaan Jamur Trichophyton rubrum pada Kuku Kaki Petugas Kebersihan Dinas Lingkungan Hidup Surabaya. Vitamin: Jurnal Ilmu Kesehatan Umum, 2(4), 360-368.

Manik, R. Z., & Siregar, P. A. (2024). Gambaran personal hygiene dengan keluhan kesehatan kulit pada petani perempuan di Desa Kuta Dame Kabupaten Pakpak Bharat. Journal of Gender and Social Inclusion in Muslim Societies, 5(2), 92-100.

Moskaluk, A. E., & VandeWoude, S. (2022). Current Topics in Dermatophyte Classification and Clinical Diagnosis. Pathogens, 11(9), 957. DOI: https://www. mdpi.com/2076-0817/11/9/957. Diakses 7 April 2024.

Munadhifah, F. (2020). Prevalensi dan Pola Infeksi Jamur Dermatofita Pada Petani (Doctoral Dissertation, Stikes Insan Cendekia Medika Jombang). Link: https://repository.itskesicme.ac.id/id/eprint/4032/. Diakses 5 April 2023.

Novitasari, H., Nashihah, S., & Zamzani, I. (2021). Identifikasi Daun Sangkareho (Callicarpa longifolia Lam) Secara Makroskopis dan Mikroskopis: Macroscopic and Microscopic Identification of Sangkareho (Callicarpa longifolia Lam.) Leaves. Jurnal Sains dan Kesehatan, 3(5), 667-672. e- ISSN 2407-6082. DOI: https://doi.org/10.25026/jsk.v3i5.570.

Nurbidayah, N., Aripansyah, M. H., & Ramadhani, D. (2018). Picture of Infectious Tinea Pedis with Direct Examination on Rice Farmers in the Village Banitan Bakumpai District July 2017 Kuala Barito. Jurnal Ergasterio, 5(2).

Nurfadilah, A., Hermansyah, H., Karneli, K., & Refai, R. (2021). Gambaran Keberadaan Tinea unguium Pada Kuku Kaki Petani Padi di Kelurahan Sungai Selincah Kecamatan Kalidoni Kota Palembang Tahun 2021. Jurnal Fatmawati Laboratory & Medical Science, 1(1), 37-48. e-ISSN 2808-8492.Link:https://ojs.poltekkesbengkulu.ac.id/index.php/flms/article/view/ 184.

Nurfadilah, A., Hermansyah, H., Karneli, K., & Refai, R. (2021). Gambaran Keberadaan Tinea Unguium pada Kuku Kaki Petani Padi di Kelurahan Sungai Selincah Kecamatan

Kalidoni Kota Palembang Tahun 2021. Jurnal Fatmawati Laboratory & Medical Science, 1(1), 37-48.

Nurfadillah, H. (2021). Identifikasi Jamur Dermatofita Penyebab Tinea Unguium pada Kuku Kaki Petani di Dusun Ballakale Desa Aska Kecamatan Sinjai Selatan Kabupaten Sinjai: Identifikasi Jamur Dermatofita Penyebab Tinea Unguium pada Kuku Kaki Petani di Dusun Ballakale Desa Aska Kecamatan Sinjai Selatan Kabupaten Sinjai. Kampurui Jurnal Kesehatan Masyarakat,

Nurhidayah, A., Dhanti, K. R., & Supriyadi, S. (2021). Identifikasi Jamur Patogen Penyebab Dermatofitosis Pada Jari Kaki Petani di Desa Bojongsari,Banyumas. Jurnal Labora Medika, 5(1), 8-17. DOI: https://doi.org/10.267 14/jlabmed.5. 1.2021.8-17.

Panjaitan, A. O. (2023). Anatomi Fisiologi Sistem Integumen. Purbalingga: Eureka Media Aksara. 161-181. ISBN 978-623-151-731-9.Link:
http://repository.uki.ac.id/id/eprint/12739. Diakses pada tanggal 22 Juni 2024.

Prayoga, A., Bastian, B., & Aristoteles, A. (2023). Perbedaan Jumlah Koloni Jamur Candida albicans Pada Media Sabouraud Dextrose Agar (SDA) dan Media Modifikasi Biji Nangka (Artocarpus heterophyllus Lamk). Journal of Indonesian Medical Laboratory and Science (JoIMedLabS), 4(1)78–86.e- ISSN 2774-2250. DOI: https://doi.org/10.53699/joimedlabs.v 4i1.142.

Purba, Y., Sinaga, J., Ayu, S. B., Purba, D., & Aritonang, E. (2021). Pemeriksaan Jamur Penyebab Tinea Unguium Pad Kuku Kaki Petani di Desa Blang Panas Kecamatan Bukit Kabupaten Benar Meriah. Jurnal Abdimas Mutiara, 2(1), 581-585.

Rachmad, B., Apriani, A., & Anggiani, Y. (2022). Identifikasi Jamur Tinea Unguium Pada Kuku Kaki Pekerja Pabrik Tahu Dan Oncom Di Kalideres Jakarta Barat. Jurnal Medical Laboratory, 1(1), 15-23.

Rachmawati, F., Nursidika, P., & Fitrianingsih, P. (2022). Identifikasi Jamur Trichophyton sp. Penyebab Tinea unguium Pada Petani Desa Mekarluyu Kabupaten Garut. Jurnal Penelitian Saintek, 2(27), 113-118. e-ISSN 2528-7036. DOI: http://dx.doi.org/10.21831/jps.v2i27.52528.

Reeda, G., & Mohammed, B. T. (2021). Use of Green Nano - Extracts in the Control of Trichophyton Rubrum. Annals of the Romanian Society for Cell Biology, 25(6), 3996 -4010. ISSN: 1583-6258. Diakses pada tanggal 28 Juni 2024. http://annalsofrscb.ro/index.php/journal/article/view/6174/4718.

Renyaan, A. R. (2020). Identifikasi telur soil transmitted helminth (STH) pada kotoran kuku petani di Kelurahan Kaliwungu Kabupaten Jombang (Doctoral dissertation, STIKes Insan Cendekia Medika Jombang).

Santika, K. D. (2024). Identifikasi Tinea Unguium pada Petugas Kebersihan di Depo Sampah Sesetan Kota Denpasar Selatan (Doctoral dissertation, Sekolah Tinggi Ilmu Kesehatan Wira Medika Bali).

Sasagawa, Y. (2019). Internal Environment of Footwear is a Risk Factor for Tinea Pedis. Journal of Dermatology, 46(11), 940–946.

Sasagawa, Y. (2019). Internal Environment of Footwear is a Risk Factor for Tinea Pedis. Journal of Dermatology, 46(11), 940–946. https://doi.org/10.1111/1346-8138.15060

Triana, D., Nawaliya, A., & Sinuhaji, B. (2021). Kejadian Infeksi Trichophyton mentagrophytes Terkait Personal Hygiene Antara Nelayan Dengan Pengolah Ikan Rumahan di Wilayah Pesisir Kota Bengkulu. Jurnal Kesehatan Kusuma Husada, 74-81. e-ISSN 2087-5002. DOI: https://doi.org/10.34035/jk.v12i1.582.

Waji, R. A., & Debit, Y. (2022). Identification of Dermatophyte Causes Tinea Capitis in Users of Hair Oil Made from Wax in Manggala District, Makassar. Jurnal Kedokteran Universitas Palangka Raya, 10(1), 28-32.

Warnock, D. W. (2016). Superficial Fungal Infections. In Infectious Diseases: Infectious Diseases E-Book (Vol. 122). Elsevier. ISBN 978-0-7020-6285-8.

Wati, R., Noverita, N., & Setia, T. M. (2019). Keanekaragaman Jamur Makroskopis di Beberapa Habitat Kawasan Taman Nasional Baluran. Jurnal Biologi, 12(2), 171-180. e-ISSN: 2502-6720. DOI: https://doi.org/10.154 08/kauniyah.v12i2.10363.

Zebua, W. I., Nurtjahja, K., & Sartini, S. (2021). Infeksi Jamur Dermatofita Pada Penderita Mikosis Kuku. Jurnal Ilmiah Biologi UMA (JIBIOMA), 3(1), 8-17. e-ISSN 2722-9777. DOI: https://doi.org/10.31289/jibioma.v3i1.539

Zulnetti, F. (2020). Identifikasi Jamur Dermatofita pada Kuku Perajin Batu Bata di Kecamatan Panti Kabupaten Pasaman Timur (Doctoral Dissertation, Universitas Perintis Indonesia). Link: http://repo.upertis.ac.id /1696/. Diakses 21 November 2023.