



The Spirit of Society Journal

International Journal of Society Development and Engagement

Phytochemical Screening of Sorghum (*Sorghum Sp*) with Thin Layer Chromatography Method

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Abstract: Sorghum is a food plant rich in benefits and has the advantage of being free gluten; it contains antioxidants and has a low glycemic index. The purpose of this research is to determine the content of compounds in sorghum. In the research, the variety of KD 4 sorghum has been used, which was macerated by absolute methanol. Results screening using thin-layer chromatography showed that methanol extract of sorghum contained flavonoid, phenol, triterpenoid, tannin, and saponin compounds, and finally, these compounds will be useful for pharmaceutical products.

Keywords: Sorghum, Phytochemical Screening, Thin layer chromatography, Pharmaceutical Products.

INTRODUCTION

Sorghum is a functional plant that has many benefits for humans, starting from meeting the nutritional needs rich in antioxidants. Sorghum can be used from grains to roots, both in the form of food, cosmetics, or animal feed. Sorghum ranks fifth in the world as a widely cultivated food crop (Noerhartati, Karyati, Soepriyono, & Yunarko, 2019). The ability of sorghum to adapt to marginal land and requires relatively little water during drought, sorghum is more tolerant than other food crops, making sorghum the top choice for agriculture during the dry season (Musara, Musemwa, Mutenje, Mushunje, & Pfukwa, 2019). Sorghum seeds have nutritional quality comparable to corn and rice, even with higher protein content and lower fat content (Awika, Rooney, Wu, Prior, & Cisneros-Zevallos, 2003). During this time, sorghum was also used to add to food and traditional medicine empirically. This makes sorghum has potential as a plant that can be used as a health product ranging from cosmetic ingredients to herbs (Abdu, 2020).

Differences in the place where sorghum grows, such as soil conditions, temperature, light, and climate, can affect the composition of each plant's phytochemical compounds. Keyongan Village, Babat District, Lamongan Regency is a place where the cultivation of Sorghum KD4 Variety. Phytochemical screening aims to find out the compounds contained in KD4 variety sorghum extract from Desa Keyongan. Phytochemical screening using thin-layer chromatography is a simple, fast, and highly selective method that can be used to identify groups of compounds and determine the presence of active compounds contained in plant tissue (Kikowska, Kruszka, Derda, Hadas, & Thiem, 2020; Oladeji, Odelade, & Oloke, 2020).



METHOD

The method or workflow of this research is as follows: Plant identification was carried out to determine the varieties of sorghum plants cultivated in Keyongan Village, Babat District, Lamongan Regency. The sample used was 0,5 kg of sorghum grains from Keyongan Village, Babat District, and Lamongan Regency.

The samples obtained are then ground and then soaked using 3 liters of absolute methanol and then macerated for three days. Then filtered and the macerate got was evaporated with a Rotary evaporator to obtain a thick extract. The method used is thin layer chromatography, phytochemical compound testing methods as follows: Flavonoids: extracts seen in stationary cellulose thin-layer chromatography (TLC) and 15% mobile phase acetic acid. Detection was carried out with ammonia vapor.

Saponin: extract is sprayed on silica gel F254 plate with ethyl acetate's cellular phase: methanol: water (100: 13.5: 10) V / V with Liebermann Burchard reagents. Tannin: The extract is sprayed on a at a distance of 1 cm from the bottom edge of the plate with a capillary tube then dried and eluted in various mobile phase ratios, namely ethyl acetate: chloroform: acetic acid (15: 5: 2), n-butanol: acetic acid: water (4: 1: 5), and n-hexane: ethyl acetate (6: 4). Stains formed were examined with UV-Vis lamps at wavelengths of 254 nm and 66 nm.

Terpenoids: This extract is sprayed on silica gel F254 T25 plates, chloroform: methanol (1: 3) mobile phase, then viewed under 366 nm UV light and sprayed with 10% H₂SO₄ reagent. Alkaloids: spray extract on silica gel plate F254, n-butanol cellular phase: acetic acid: water (4: 1: 5) v / v with Dragendof spray reagents. (Hasibuan, Syahfitri, Ilyas, & Hutahaeen, 2020; Widyaningsih W., Pramono S., 2016).

RESULTS

Phytochemical screening results of methanol sorghum extract can be seen in the following Table 1. Sorghum is a food substitute for rice that has a comparative advantage over corn, wheat and rice. Sorghum is rich in 73% carbohydrates, 3.5% fat, and 10% protein, depending on the variety and location of planting (Li, Jeong, Lee, & Chung, 2020).

Table 1. Phytochemicals Screening of Sorghum KD 4 Variety.

Secondary metabolites	Color spots on Thin Layer Chromatography Plates	Result
Flavonoid	Blue light	(+)
Triterpenoid	Violet	(+)
Tannin	Black	(+)
Saponin	Tawny	(+)
Fenol	Blue	(+)

Description: Positive (+) Negative (-)



The development of sorghum as a food crop through product diversification makes the potential of sorghum as an herbal medicinal plant that has pharmacological effects. To be used as raw material for herbal medicines, standardization needs to be done. One of the parameters for standardization of traditional medicinal ingredients is information about secondary metabolites and the profile of this plant extract using thin layer chromatography (TLC) (Raj, 2020).

Phytochemical screening is conducted to determine secondary metabolites found in sorghum, as the initial stage of processing pharmaceutical products. Extraction is done by maceration method to attract substances in tissues to sorghum cells, the advantage of this method is that it only requires fat solvents for example, ethanol or methanol to soak and produce good extract products, besides this technique does not damage the active compounds caused by warming (Makuasa & Ningsih, 2020).

The results of phytochemical screening can be seen in Table 1. The sorghum methanol extract in the TLC test proved the presence of compounds, phenols, triterpenoids, flavonoids, tannins, and saponins.

Flavonoid test results on sorghum methanol extract showed positive results with bright blue spots on TLC plates. Flavonoids are secondary metabolites that are most often found in plant structures. Some research results show that there is a negative correlation between flavonoid intake and risk of coronary heart disease. The cardioprotective effect of flavonoids as a food source in addition to the cardioprotective properties of flavonoids which have antiproliferation properties against cancer cells (Ayza, Balasubramanian, & Berhe, 2020; Ferenczyova, Kalocayova, & Bartekova, 2020) and have antioxidant, antiparasitic and anti-bacterial roles. Because of its antioxidant properties, flavonoids are often added in cosmetics because of their antibacterial properties (Herlina, Rudiana, Julaeaha, & Parubak, 2019; Mead & McNair, 2006).

Triterpenoid test results with TLC showed positive results by marking a purple dot on the TLC plate. Triterpenoids in the health world are used as antioxidants, besides that triterpenoids have immunomodulating and anti-tumor activity (Giuberti, Marti, Gallo, Grassi, & Spigno, 2019). Triterpenoids have inflammatory, antidepressant, protective properties on brain cells. Several structural groups of triterpenoids have shown specificity in transcription factors which can be promising candidates for treating inflammation, cancer, and immune disease (Sadaq, Seetharamaiah, Pamar, & Mehar, 2013).

Tannin test results with TLC showed positive results in the presence of black stains on the TLC plates. Tannin is a compound found in most plants, tannin has a function as a chelating protein, chelator properties make tannin can be used as a chelator to heavy metals in the microbiology world, tannins have the activity of inhibiting protein synthesis in bacterial cells so tannins are often used as astrigence and have high antioxidant ability as free antiradical (Ashok & Upadhyaya, 2012).

Saponin test results with TLC showed positive results in the presence of brownish stains on the TLC plates. The presence of saponins in plants is often characterized by the presence of foam in plants. Saponin is often used as an antiseptic such as soap because of its very strong antibacterial properties (Ngajowa et al 2013). Saponins are also often used as anticancer because of their cytotoxic activity against cancer cells (Aboutalebi & Monfared, 2016; Podolak, Galanty, & Sobolewska, 2010).

THE SPIRIT OF SOCIETY JOURNAL

International Journal of Society Development and Engagement

ISSN : 2597-4777 (Online) - ISSN : 2597-4742 (Print)

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The phenol test results showed a light blue color on the TLC plates which indicated that sorghum extract contained phenolic groups. Phenols are compounds that have high antioxidant activity and function to reduce reactive oxygen species. Phenol can be used as a prevention or treatment for diseases caused by oxidative stress. Besides that, phenol also has a strong anti-bacterial function, especially against gram-positive bacteria (Fu et al., 2010; Ravanfar, Karimi, Mehrabanjoubani, & Ebrahimi, 2020).

TLC results of KD 4 sorghum seed varieties contain phytochemicals which have been instrumental in the treatment of various diseases, in this case sorghum seeds have potential as medicinal plants which can be developed into various pharmaceutical products.

CONCLUSIONS

Based on the results of this study it can be concluded that extracts from KD 4 sorghum seeds contain phytochemical contents as follows: Flavonoids, tannins, triterpenoids, saponins, and phenols. Sorghum methanol extract has potential as a pharmaceutical product. The results obtained from the research have to be supported by sufficient data. The research results and the discovery must be the answers, or the research hypothesis stated previously in the introduction part.

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International Journal of Society Development and Engagement

ISSN : 2597-4777 (Online) - ISSN : 2597-4742 (Print)

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