STM JOURNALS

Research & Reviews: A Journal of
Pharmacognosy

ISSN: 2394-7276
Volume 12, Issue 2, 2025
May–August
DOI (Journal): 10.37591/RRJoPC

https://journals.stmjournals.com/rrjopc

Review RRJoPC

# Review of *Dioscorea alata* and Its Pharmacological Application

Prashant Wagh[1,*], Abhijit V. Shrirao[2], A. V. Chandewar[3]

***Abstract***

*Dioscorea alata, also known as water yam, is an important crop found worldwide. About 600 different species have been reported worldwide. Many nations, including South America, Africa, Australia, and the southern United States, cultivate D. alata. D. alata is a member of the Discordance family and has been demonstrated to possess anti-inflammatory, anti-apoptotic, and antioxidant qualities. Dioscorea's metabolites include phenolic chemicals, which reduce sugars, flavonoids, glycosides, saponins, alkaloids, anthraquinones, proteins, tannins and others like alkali, mucin, allantoin, crude oil, etc., crude fiber, catechins, chlorogenic acid, proanthocyanidins, myricetin, diosgenin and sapogenin. Diosgenin is one of the major steroid glycosides and has been reported to have many activities, such as anti-diabetic, anti-hypertensive, anti-cancer, anti-inflammatory inflammation and cardioprotective activity. Diosgenin has antioxidant and anti-apoptotic activities and is beneficial in the treatment of heart disease. Also, it has been demonstrated that diosgenin increases glutathione, SOD, and catalase activity while decreasing oxidative stress. Diosgenin has been reported to inhibit apoptosis by reducing the activity of the pro-apoptotic factor caspase . In addition, bioactive compounds including diosgenin, anthocyanins, and D. alata tuber dietary fiber can prevent hyperlipidemia by normalizing blood lipids. Nevertheless, further investigation is required to examine the impact of D. alata on cardiovascular conditions.*

**Keywords:** *Dioscorea alata*, diosgenin, antioxidant, pharmacological potentials, purple yam

## INTRODUCTION

*Dioscorea alata* is an herbal plant found naturally in various area of the world, such as tropical area, Africa, Australia. The North America, Japan, China, Mexico, India, and Nepal sell the plant. *D. alata* is a species that grows all over the world. There are about 600 varieties of this plant worldwide. *D. alata*'s names are Kath Alu, Banra, Bahra, and is also known as water yam, blood yam, ube or big yam. The orchid has purple stems, long-stalked wings, glossy green leaves and yellow–white flowers. Dioscorea is an annual and perennial climbing plant. *D. alata* is the main source of nutrients. The plant tubers are cylindrical in shape, and the tuber flesh is white and juicy. These plants, which can reach 20–30 meters in height, are seasonal plants with tubers ranging in color from purple to bright lavender. *D. alata* has different contents Arata muaj diosgenin, diosgenin, diosgenin, choline, mucin, allantoin, roj raw, crude fiber, catechin, chlorogenic acid, procyanidins, myricetin, diosgenin, tiab sapogenin. Asparagus kuj muaj glycosides, flavonoids, alkaloids, tannins, triterpenes, coumarins, cog sterols, steroids, tiab lwm yam, magnesium, manganese. D. Multiple pharmacological kev ua ub no alata, mainly due to the chemical Dioscorea found in its tissues, has anti-

***Author for Correspondence**
Prashant Wagh
E-mail: prashantrwagh24@gmail.com

[1]Student, Department of Pharmacy, Pataldhaml Wadhwani College of Pharmacy, Moha Phata, Yavatmal, Maharashtra, India.
[2]Professor, Department of Pharmaceutical Chemistry, Pataldhaml Wadhwani College of Pharmacy, Moha Phata, Yavatmal, Maharashtra, India.
[3]Principal & Professor, Department of Pharmaceutical Chemistry, Pataldhaml Wadhwani College of Pharmacy, Moha Phata, Yavatmal, Maharashtra, India.

Received Date: May 08, 2025
Accepted Date: May 29, 2025
Published Date: June 16,2025

**Citation:** Prashant Wagh, Abhijit V. Shrirao, A. V. Chandewar. Review of *Dioscorea alata* and Its Pharmacological Application. Research and Reviews: Journal of Pharmacognosy. 2025; 12(2): 80–86p.

diabetic, anti-hypertensive, antioxidant and anti-apoptotic activities, anti-inflammatory, anti-cancer, anti-inflammatory, cardioprotective, hypolipidemic, hypocholesterolemia activities, etc. [1]. Among the saponins, diosgenin is the most beneficial substance in Dioscorea and has antioxidant activity. Many studies have shown the cardioprotective effects of antioxidants because these substances protect the myocardium from ischemia-reperfusion injury. Other natural antioxidants found in Dioscorea, diosgenin and diosgenin also protect cells from oxidative stress by blocking ROS formation. The presence or absence of 27 electroforms characterizes each of the 66 isoenzyme phenotypes or enzyme types displayed by the four polymorphic enzyme systems (MDH, PGI, SkDH, and 6PGD). It was observed that the same type of enzyme was distributed in different regions of Africa and the Caribbean and different types of enzymes were found in the same region. The diversity of the region in the New Caledonian germplasm bank was then evaluated and 131 morphotypes were identified from 25 morphological agronomic descriptors (Figure 1) [2].

**Figure 1.** *D. alata* tuberous roots.

The types of enzymatic accessions were compared with four major morphotype groups. Tuber physicochemical properties (percent dry matter, percent starch, total nutrients, protein content, polyphenolic compounds, phosphorus, potassium and calcium) elements were also analyzed for each of the 131 accessions and three main chemotypes were identified. There is no relationship between morphotypes, enzymatic types and chemotypes of accessions grown in different gardens. Many cultivars exhibit changes in traits, such as anthocyanin pigmentation that may be due to human selection for somatic mutations. The largest species, *D. alata*, has a narrow base. However, the genetic changes present are also due to the old sex, as isozyme patterns suggest [3]. Dioscorea may be a true species and not the previously reported plant. *D. alata* has been underestimated due to traditional prejudices that have ignored the nutritional and agronomic flexibility of this species. Although not cultivated to the extent of the African species, it has the widest distribution of any cultivated crop worldwide, being cultivated in Asia, the Pacific Islands, Africa and the West Indies. It is favorable agronomic traits – such as its high nutritional content, ease of propagation and yield, and capacity to store new tubers for an extended period – give it a comparative edge in sustainable agriculture. Jerusalem artichokes are not food in and of themselves. Malnutrition occurs in poor areas where only cereals and other root crops are consumed as staple foods, and can cause many health problems, including significant health problems, cognitive impairment, and physical development, especially micronutrient deficiencies. These further affect academic performance and affect economic growth by reducing work capacity and life expectancy. These deficiencies are often caused by micronutrient deficiencies, food processing, and/or malabsorption of food [4].

High intakes of important nutrients combined with low intakes of foods high in micronutrients, such as fruits, vegetables, meat, and fish, are indicative of a micronutrient-deficient diet. The impoverished, who favor starchy meals like potatoes, frequently find the latter to be excessively costly. In their writings on yams, other authors have also included information regarding nutritional qualities. Food insecurity has historically been addressed by food protection and supplementation through intervention programs. Even when successful, beneficiaries are unable to support these activities. A better nutrition-based approach will be sustainable in combating micronutrient deficiencies. Researchers have focused on investigating the nutritional quality of foods commonly used in developmental research. This study investigated the biochemical and nutritional composition of 16 *D. alata* species to provide scientific information for use in breeding programs to improve the nutrition of good local staples, such as potatoes [5].

## PHYTO-CHEMISTRY OF *DIOSCOREA ALATA*

Various parts of *Dioscorea scutellariae* contain various phytochemicals reported to have biological potential. The bitter and unpleasant taste of Dioscorea tubers is due to diosgenin A and B and diosgenin, which are toxic to the nervous system and cause vomiting and diarrhea. The main component of Dioscorea is diosgenin, which has been shown to have many medicinal functions, such as anti-diabetic, anti-inflammatory and cardioprotective activity. Diosgenin's anti-apoptotic and antioxidant qualities make it useful against heart disorders. Dioscorea also contains discoing, diosgenin, choline, mucin, allantoin, crude fat, crude fiber, dietary fiber (7%), carbohydrates (5.7), protein (6.0%), amylase (29.5), Catechins, chlorogenic acid, proanthocyanidins, myricetin, discoing and sapogenins. Inorganic substances in tubers include aluminum, vitamin C, calcium, potassium, cobalt, iron, magnesium, manganese, vitamin B3, $PO_4$, vitamins B2 and B1, selenium, silicon, sodium, tin, and zinc. Biological compounds in Dioscorea include glycosides, flavonoids, alkaloids, tannins, triterpenes, coumarins, plant sterols, and steroids [6]. Diosgenin effectively reduces inflammation by reducing inflammatory cells, such as TNF-α, LT, IL-6, and AST and ALT. Diosgenin reduces oxidative stress and increases the activity of glutathione, SOD, and catalase, and has been shown to have strong antioxidant and antiapoptotic effects on cardiovascular disease. Diosgenin has been reported to prevent apoptosis by inhibiting the activation of the pro-apoptotic factor caspase 9 [7].

## PHARMACOLOGICAL APPLICATION OF *D. ALATA* IN DIFFERENT DISEASES

### Cardiovascular Disease

WHO reported that 17.9 million people death occurs due to CVDs in 2016 globally. Various diseased conditions are responsible for causing heart disease, such as hypertension, diabetes as well as hyperlipidemia. Males are more prone to heart attack than females. Mostly people of low-income countries are affected more. Furthermore, from 2017 report, WHO mentioned that 31% global deaths occur due to heart disease. In England around 34% death were caused due to Coronary vascular disease, in Europe around 40% deaths due to CVDs. Currently, 80% mortality in developing countries is reported to be due to CHD. The risk factors associated with CVDs are smoking, alcohol consumption, diabetes, high blood pressure, high cholesterol level, junk food, atherosclerosis, etc. From US data, it was found that 30% of deaths in US are due to smoking. According to Barinderjit Kaur, smoking is the most effective treatment in controlling CAD. For reducing the risk of heart diseases, patients should concentrate on the food habits, exercise, blood pressure, on lipid profile. Stress is the hall mark of cardiovascular diseases. Empirically developed dietary inflammatory potential (EDIP) is associated with obesity, a cardio metabolic risk factor. EDIP can be used for identification of cardiovascular disease risk factors [8]. The ethanol and water extract of *D. purpurea, D. japonica* and *D. alata* have been reported to reduce the cardiotoxicity against doxorubicin (DOX)-induced myocardial infarction by reducing the level of TBARS, LDH, ROS and blood pressure. DOX causes oxidative stress, elevated blood pressure, and caspase 3 activation, all of which result in apoptosis. Dioscorea extracts are found to be effective in heart disease due to having antioxidant, anti-inflammatory and antiapoptotic activity. Powdered drug of *dioscorea rhizome* has reduced oxidative damage in heart and atherosclerosis in hyperlipidemia. Dioscin from the *Dioscorea alata* is also effective in myocardial infarction against streptozocin induced diabetes. Dioscin activates the MAPK pathway and inhibits angiotensin II activation and protects the heart from myocardial hypertrophy. Diosgenin reduces the inflammatory mediators, such as TNF-a, NFkB and COX, etc. Steroidal sapogenin of *D. alata* is effective in myocardial ischemia reperfusion injury [9].

 

**Inotropic Activity**

Saponin alters the electrical and mechanical activity of myocardium. Saponin also involved in the formation of new blood vessel from pre–existing blood vessel. Saponin also possesses vasodilatory activity by stimulating cGMP acting through voltage sensitive $Ca^{2+}$ channels. This results in lowering calcium in circulation and, therefore, decreases the vasoconstriction due to calcium [10].

**Antioxidative Activity**

Oxidative stress plays an important function in the pathogenesis of various diseases, such as neurodegenerative disease like Parkinson's disease, Alzheimer's, dementia and cardiovascular disease, such as atherosclerosis, myocardial ischemia and heart attack, inflammatory disease, such as arthritis, hepatitis, allergies, inflammatory lung injury and carcinogenesis, metabolic disorder like diabetes mellitus. Generation of ROS increases the level of TBARS, LDH, CK, MDA and TGF-β1, as well as increase the level of AST & ALT in liver injury. The dioscin present in *D. alata* reduces all the inflammatory parameters and increases the level of SOD, CAT, glutathione and glutathione peroxidase. The different types of phytoconstituents found in *D. alata* are saponins, glycosides, flavonoids, tannins, phenols, etc. The polyphenol in the form of flavonoids in alata shows good antioxidant activity as it has good free radical scavenging activity. The phenolic compounds found in this plant have been reported to have number of biological activities like anti-inflammatory, antitumor and antimicrobial including antioxidant activity. The secondary metabolites of the plant *D. alata* are phenolic, alkaloids, saponins, terpenes, lipids, glycosides and carbohydrates. Aluminum chloride method was used to determine the flavonoids. Steroidal saponin and diosgenin constituents are effective in apoptosis by arresting cell [11].

**Antiapoptotic Activity**

Apoptosis is the programmed cell death, characterized by the fragmentation of nuclear DNA, and therefore, apoptotic bodies are formed. Macroscopic characteristics of apoptosis is blebbing; bulge of the plasma membrane, plasmolysis, karyorrhexis, karyopyknosis, and apoptotic stimulatory factors, such as bid, bak, bax and caspase-3. The anti-apoptotic factors, like bcl-2 family, acts against apoptosis and protect the cells from damage. The ethanolic extracts of *Dioscorea alata* having protective activity against apoptosis cell death in cardiotoxicity, dioscin, a constituent of *D. alata* has been reported to decreases the proliferation of cells and acts against the caspase-3 and caspase-9. Diosgenin also known to protect the cells from apoptosis. The best process to determine the total number of apoptotic cells in apoptosis is tunnel assay. Formalin is used as a fixation solution and propidium iodate is used as a stain. The viable cells will appear as white and damaged cells appear as colored [12].

**Anti-Cancer Activity**

Diosgenin and dioscin, the main active constituents of *Dioscorea alata*, are effective in several types of cancer. The diosgenin exerts anti-tumor activity through intrinsic mitochondrial apoptosis. Mitochondrial apoptosis occurs due to activation of caspase-9, caspase-3 as well as increase in pro-apoptotic proteins, such as bak, bax and bid. Diosgenin has been found to reduce pro apoptotic proteins and enhance the activity of anti-apoptotic proteins. 70% methanolic extract of *D. alata* is effective in treatment of cancer and has potential to reduce ROS, as it is a good antioxidant. Furthermore, saponins in *D. alata* have outstanding role in destruction of cancerous cells as it interferes with cell division and growth of cancer cells. As cancerous cells are known to possess more cholesterol levels, diosgenin and other alkaloids have been found to have chemoprotective action against cholesterol related inflammation in cancer cells. This chemoprotective function is achieved due to alteration of lipid related metabolism in cancer cells [13].

**Anti-Diabetic Activity**

The diosgenin extracts has been reported to possess anti-diabetic and anti-inflammatory activity. Diabetes is characterized by hyperglycemia, polyuria, polyphagia, weight loss, excessive thirst and blurred vision. The most prevalent complications due to diabetes are retinopathy, neuropathy, and nephropathy as well as atherosclerosis and heart attack. Diosgenin and dioscin reduces related complications due to diabetes. Ethanolic extract of *Dioscorea alata* has significant effect on diabetes mellitus against alloxoninduce diabetes. Allantoin in *D. alata* have also shown the antidiabetic activity against streptozocin induced diabetes mellitus. WHO reported that 90% of the population from developing countries uses traditional drug for primary treatment of diabetes [14].

**Anti-Hypertensive Activity**

Hypertension is most common disease in developed as well as developing countries. Dioscorin is one of the chemical constituents of *D. alata* that has been reported to have antihypertensive activity. Along with dioscorin, diosgenin is another chemical constituent having anti-hypertensive, anti-inflammatory and antioxidant activity. Diosgenis is obtained by acidic hydrolysis of glycosides present in *D. alata* have been found to possess vaso-relaxing and anti-hypertensive activity [15, 16].

**Hyperlipidemic Activity**

Diosgenin in *D. alata* decreases LDL, triglyceride and total cholesterol and increases good cholesterol HDL. In one study, the crude diosgenin extracts of *D. alata* tubers have been reported to improve blood lipid profiles. In this study, the purple yam *D. alata* diosgenin crude extract exhibit more improvement in lipid profile than yellow yam. Diosgenin controls hypercholesterolemia and improves lipid profile as it lowers low density lipoproteins and triglycerides. Diosgenin inhibits cholesterol synthesis through the inhibition of HMG-CoA reductase. Therefore, both crude extracts of diosgenin from *D. alata* have been reported to enhance fecal cholesterol secretion and improvement in blood lipid profiles [16, 17].

**Phylogeny**

Dioscorea is thought to have begun in New Guinea around 10,000 bp, but starch has been found in stone tools from New Guinea archaeological sites and has been dated to 46,000 bp. Its geographic origin is unknown, but it may have been used more frequently in different regions. DNA markers have been used to shed light on long-standing, sometimes controversial mysteries. For decades, although the words are interchangeable, *D. alata* was formerly believed to be the product of hybridization between two Asian species (*D. alata* hamiltonii and *D. persimilis*). According to AFLP markers, *D. alata* and *D. nummularia*, a species that is restricted to eastern Indonesia and Melanesia, have a similar genetic background [18]. There are hundreds of species in Melanesia, making it a very diverse place. *D. alata* is closely related to *D. hamiltonii* and *D. nummularia*, according to DNA phylogeny. Nevertheless, DNA research continues to indicate that *D. alata* and *D. calcicola* are closely related. *D. alata* shares a close relationship with *D. calcicola*, *D. fordii*, and *D. glabra*. This group did not include *D. nummularia* or *Hamiltonii* DNA markers revealed that *D. alata* is more closely related to *D. oppositifolia* in India than to *D. alata* in Hamiltonii, while it was linked to *D. persimilis* in China, *D. polystachya* (sometimes called *D. japonica*, *D. opposita*, or *D. hamiltonii, D. oppositifolia*) and *D. glabra*. This choice just serves to increase the overall uncertainty, as many studies indicate that some taxes are extremely similar and might not be separate species. Although the huge fruit is primarily seen in Africa, it is undoubtedly an Asian variant [19].

**REQUIRED PLANTING MATERIAL**

To test a variety denomination for registration under the Protection of Plant Varieties and Farmers' Rights (PPV&FR) Act, 2001, the Protection of Plant Varieties and Farmers' Rights Authority (PPV&FRA) will determine the time, location, quantity, and quality of the plant material needed.

1. When sending such material from a nation other than India, applicants must ensure that they comply with all customs and quarantine requirements outlined in the applicable national laws and regulations.
2. Tubers are to be used to supply the substances. Ten healthy tubers weighing between 750 and 1100 grams each, free of sprouts and epidermal damage, should be the bare minimum of planting material that the applicant provides. The tubers must be properly labeled and packaged in a cotton fabric bag.
3. The planting material provided must be robust, free from pests and diseases, and certified to have the maximum genetic stability and uniformity among propagated material, among other qualities.

 

4. Unless specifically requested by the Authority's Registrar, the plant material should not have received any chemical or biophysical treatment that would alter the expression of the variety's features. If it has received treatment, comprehensive information about that treatment must be given [20–22].

**Testing Process**

1. DUS testing typically lasts at least two separate, comparable growing seasons with two consecutive plantings, the second of which is replanting using the first season's harvested plant material or in accordance with the candidate variety's agroclimatic conditions.
2. Typically, the test must be carried out at least twice. The variety will be considered for additional inspection at a third suitable test site or under a unique test protocol upon the applicant's express request if any critical traits of the candidate variety are not visible at these sites.
3. The field testing must be conducted in an environment that supports the normal development and manifestation of every test characteristic. The plot must be large enough to allow for the removal of plants or portions of plants for measurement and observation without affecting the remaining observations of the standing plants until the end of the growing season.
4. About 25 plants in each test, spread across three replications, must be planted in the plot size (4.5 m × 4.5 m) and planting area indicated below. It is only possible to employ distinct plots for measurement and observation if they have undergone comparable environmental conditions.
5. The test location's environmental conditions must be shared by all replications [23–25].

## CONCLUSIONS

On average, the biochemical composition of *D. alata* was compared with that reported in the literature. Its moisture and protein content are very high compared to other root crops. Sugar and starch levels are 3.6–11.0% and 60.3–74.4%, respectively. In some experimental cultivars, TDF content is as high as 11%. Phosphorus, calcium, potassium, zinc, manganese, and copper are all abundant in tubers, Though it is low in sodium. The results show that *D. alata* species can be a good source of nutrients for consumers and can also be useful in food and nutrition use. Significant changes were observed among animals, indicating the potential for improvement through breeding in promising animal breeding. Saponins, flavonoids, polyphenols and tannins have been reported to have hypolipidemic, antidiabetic, anticancer, antiapoptotic, antihypertensive, and anti-inflammatory properties for various diseases, antibiotics, diseases, antibiotics, antibiotics and anti-inflammatory drugs. As a result, it may be a suitable substitute for synthetic medications in the management of numerous illnesses.

## REFERENCES

1. Adesanya SA, Ogundana SK, Roberts MF. Dihydrostilbene phytoalexins from Dioscorea bulbifera and D. dumentorum. Phytochemistry. 1989;28(3):773–4.
2. Ahmed LA, Al-Arqam ZO, Zaki HF, Agha AM. Role of oxidative stress, inflammation, nitric oxide and transforming growth factor-beta in the protective effect of diosgenin in monocrotaline-induced pulmonary hypertension in rats. Eur J Pharmacol. 2014;740:379–87.
3. Akbarzadeh A, Norouzian D, Mehrabi MR, et al. Induction of diabetes by Streptozotocin in rats. Indian J Clin Biochem. 2007;22:60–4. https://doi.org/10.1007/BF02913315.
4. Araghiniknam M, Chung S, Nelson-White T, Eskelson C, Watson RR. Antioxidant activity of Dioscorea and dehydroepiandrosterone (DHEA) in older humans. Life Sci. 1996;59(11):PL147–50.
5. Baah FD, Maziya-Dixon B, Asiedu R, Oduro I, Ellis WO. Nutritional and biochemical composition of D. alata (Dioscorea spp.) tubers. J Food Agric Environ. 2009;7(2):373–8.
6. Bhandari MR, Kawabata J. Bitterness and toxicity in wild yam (Dioscorea spp.) tubers of Nepal. Plant Foods Hum Nutr. 2005;60:129–35. https://doi.org/10.1007/s11130-005-6841-1
7. Binesh A, Devaraj SN, Halagowder D. Atherogenic diet induced lipid accumulation induced NFκB level in heart, liver and brain of Wistar rat and diosgenin as an anti-inflammatory agent. Life Sci. 2018;196:28–37.

 

8. Chang WC, Yu YM, Wu CH, Tseng YH, Wu KY. Reduction of oxidative stress and atherosclerosis in hyperlipidemic rabbits by Dioscorea rhizome. Can J Physiol Pharmacol. 2005;83(5):423–30.
9. Chen CT, Wang ZH, Hsu CC, Lin HH, Chen JH. Taiwanese and Japanese yam (Dioscorea spp.) extracts attenuate doxorubicin-induced cardiotoxicity in mice. J Food Drug Anal. 2017;25(4):872–80.
10. Corbiere C, Liagre B, Bianchi A, Bordji K, Dauça M, Netter P, et al. Different contribution of apoptosis to the antiproliferative effects of diosgenin and other plant steroids, hecogenin and tigogenin, on human 1547 osteosarcoma cells. Int J Oncol. 2003;22(4):899–905.
11. Devarkar V, Bhogaonkar P. Phytochemical studies on unexplored ethnovegetables from Melghat (Dist. Amravati) Maharashtra. Life Sci Leafl. 2014;48:23–8.
12. Dey P, Roy Chowdhuri S, Sarkar MP, Chaudhuri TK. Evaluation of anti-inflammatory activity and standardisation of hydro-methanol extract of underground tuber of Dioscorea alata. Pharm Biol. 2016;54(8):1474–82.
13. Dumont R, Vernier P. Domestication of yams (Dioscorea cayenensis-rotundata) within the Bariba ethnic group in Benin. Outlook Agric. 2000;29(2):137–42.
14. Dutta B. Food and medicinal values of certain species of Dioscorea with special reference to Assam. J Pharmacogn Phytochem. 2015;3(5).
15. Farhangi MA, Najafi M. Dietary inflammatory index: a potent association with cardiovascular risk factors among patients candidate for coronary artery bypass grafting (CABG) surgery. Nutr J. 2018;17(1):20.
16. Farombi EO, Britton G, Emerole GO. Evaluation of the antioxidant activity and partial characterisation of extracts from browned yam flour diet. Food Res Int. 2000;33(6):493–9.
17. Ravindran G, Wanasundera JPD. Chemical changes in yam tubers (Dioscorea alata and D. esculenta) during storage. (No. RESEARCH). 1993.
18. Hamburger M, Dudan G, Nair AR, Jayaprakasam R, Hostettmann K. An antifungal triterpenoid from Mollugo pentaphylla. Phytochemistry. 1989;28(6):1767–8.
19. Harijono H, Estiasih T, Ariestiningsih AD, Wardani NAK. The effect of crude diosgenin extract from purple and yellow greater yams (Dioscorea alata L.) on the lipid profile of dyslipidemia rats. Emirates J Food Agric. 2016;28(7):506–12.
20. Hgaza VK, Diby LN, Tié TB, Tschannen A, Aké S, Assa A, et al. Growth and distribution of roots of Dioscorea alata L. do not respond to mineral fertilizer application. Open Plant Sci J. 2011;5(1).
21. Hochu I, Santoni S, Bousalem M. Isolation, characterization and cross-species amplification of microsatellite DNA loci in the tropical American yam Dioscorea trifida. Mol Ecol Notes. 2006;6(1):137–40.
22. Hou WC, Chen HJ, Lin YH. Dioscorins from different Dioscorea species all exhibit both carbonic anhydrase and trypsin inhibitor activities. Bot Bull Acad Sin. 2000;41(3):191–6.
23. Huang W, Zhao H, Ni J, Zuo H, Qiu L, Li H, et al. The best utilization of D. zingiberensis CH Wright by an eco-friendly process. Bioresour Technol. 2008;99(15):7407–11.
24. Imanningsih N, Muchtadi D, Palupi NS, Wresdiyati T, Komari K. The tuber extract and flour of Dioscorea alata normalize the blood lipid profile of rabbits treated with high cholesterol diets. Health Sci J Indones. 2014;5(1):23–9.
25. Kaur B, Khatun S, Suttee A. Current highlights on biochemical and pharmacological profile of Dioscorea alata: A review. Plant Arch. 2021;21(1):552–9.


 