

Short Communication

Anti-inflammatory studies of yam (*Dioscorea esculenta*) extract on wistar rats

J. O. Olayemi and E. O. Ajaiyeoba*

Department of Pharmacognosy, University of Ibadan, Ibadan, Nigeria.

Accepted 4 July, 2007

The defatted methanol extract of *Dioscorea esculenta* tuber was evaluated for anti-inflammatory properties in animal model using Wistar rats. The study was done using the cotton thread method in measuring the right hind paw oedema and granuloma tissue formation in rats. The extract was tested at doses between 100 – 200 mg/kg body weight of rats. Preliminary phytochemical screening confirmed the presence of saponins, disgenin, β -sistosterol, stigmasterol, cardiac glycosides, fat and starch. The extract exhibited significant inhibition of the carrageenan-induced oedema that was dose-dependent with a good initial effect in 1 h and 2 h at doses of 100 mg/kg and 150 mg/kg, respectively. The observed activity was comparable to that of 150 mg/kg acetylsalicylic acid that was used as a reference drug in the study. *D. esculenta* tuber methanol extract supports the folkloric use for management of inflammation.

Key words: *Dioscorea esculenta*, Wistar rats, anti-inflammatory activity.

INTRODUCTION

Dioscorea esculenta (Dioscoreaceae) is an edible tuber found in Nigeria, China, Mexico and some other parts of the world. The tuber is a staple food in most parts of West Africa including Nigeria. Externally, the tuber has been applied to ulcers, boils and abscesses. It contains allantoin, a cell-proliferant that speeds up the healing processes. It has been used traditionally as a contraceptive, in the treatment of menopausal symptoms and various disorders of the genital organs. It has been suggested for ethnomedicinal uses as an antifatigue, anti-inflammatory, anti-stress, anti-spasmodic and immune deficiency remedies in various ethno-medicines. The peel has been reported to possess anticancer and antifungal properties. The main constituent of *Dioscorea* species is the well-known saponin, dioscin. The aglycone, diosgenin, is the major starting material used in the industrial production of steroidal hormones. Diosgenin has also been utilized for hundreds of years to treat rheumatism and arthri-tis-like ailments (Krochmal et al., 1973; British Herbal Pharmacopoeia, 1983; Sofowora, 1993). In addition, it is used for spasmodic cough, diarrhea and nausea of pregnant women. Dioscoretine has been shown to be

the hypoglycemic agent of *Dioscorea dumetorum* (Lassack et al., 1983; Aderiyee et al., 1996; Iwu et al., 1990). Herein, is a report of the anti-inflammatory activity of the defatted methanol extract of the tuber of *D. esculenta* using carra-geenan-induced rat paw oedema in continuation of our studies on Nigerian *Dioscorea* species.

MATERIALS AND METHODS

Plant collection and authentication

D. esculenta tubers were obtained from International Institute of Tropical Agriculture (I.I.T.A.), Ibadan on July 2004. It was authenticated in the Herbarium of the Forestry Research Institute Herbarium, Nigeria (FRIN), Ibadan by Mr. G. Ighanesebhor where a voucher specimen was deposited as TDES 3039.

Preparation and extraction of plant materials

Dried powdered *D. esculenta* (1.25 kg), was first defatted with n-hexane (re-distilled) for 18 h in a Soxhlet apparatus and the extracted with methanol (re-distilled) for another 18 h. Solvent removal afforded 13.8 g extract which was stored in universal bottles at room temperature (28 - 30°C).

Animals

Wistar rats (100–180 g) were used. They were divided into 5 groups of 5 animals per group. The animals, bred and housed under

*Corresponding author. E-mail: edajaiye@yahoo.com.

Table 1. Anti-inflammatory activity of different concentrations of *Dioscorea esculenta* methanol extract.

Dose of Extract/ drug	Circumference of the hind paws \pm SEM (cm)/time					
	0	1 h	2 h	3 h	4 h	5 h
100 mg/kg	2.15 \pm 0.05	2.31 \pm 0.01	2.65 \pm 0.03	2.5 \pm 0.06	2.2 \pm 0.25	2.25 \pm 0.03
150 mg/kg	2.12 \pm 0.02	2.38 \pm 0.05	2.68 \pm 0.05	2.43 \pm 0.16	2.28 \pm 0.1	2.18 \pm 0.04
200 mg/kg	2.08 \pm 0.04	2.22 \pm 0.08	2.38 \pm 0.08	2.55 \pm 0	2.24 \pm 0.09	2.1 \pm 0.06
ASA (150 mg/kg)	2.15 \pm 0.08	2.25 \pm 0.03	2.42 \pm 0.04	2.55 \pm 0.03	2.4 \pm 0.03	2.36 \pm 0.02
Saline 0.9%	2.2 \pm 0.07	2.53 \pm 0.03	2.93 \pm 0.04	2.96 \pm 0.03	2.72 \pm 0.05	2.6 \pm 0.04

Values indicated represent the circumference of paws (cm). Values are mean \pm S.E.M. n = 5; *P < 0.05.

under standardized environmental conditions in the Animal House, Faculty of Pharmacy, University of Ibadan, Ibadan were fed with standard diet (Ladokun Feeds Limited, Ibadan) and water *ad libitum*.

Phytochemical studies

The powdered drug was screened preliminarily to confirm the presence of saponins and other secondary metabolites using previous procedure (Trease and Evans, 1983; Ajaiyeoba et al., 2003).

Carrageenan-induced rat paw oedema

To test the effect of the methanol extract on acute inflammation, the method described by (Winter et al., 1962) was used. Rats housed in five groups were injected with carrageenan (0.1 ml, 1%) was injected in the right hind paw of each rat under the sub-planter region, respectively. They were then administered the extract (100 – 200 mg/kg), by oral route 1 h before carrageenan injection. Control rats received an equal volume (10 ml/kg) of saline (0.9%), and acetylsalicylic acid (150 mg/kg) was used as reference for positive control. Increase in linear paw circumference was taken as a measure of oedema (Hess and Milonig, 1972; Olajide et al., 1998, 1999, 2000).

Statistical analysis

Values are expressed as means \pm S.E.M. Statistical significance was determined using the student's *t* – test and values with P < 0.05 were considered significant.

RESULTS AND DISCUSSION

The phytochemical screening of *D. esculenta* confirmed the presence of saponins, β -sistosterol, stigmasterol, cardiac glycosides, fats, starch and diosgenin. The anti-inflammatory result of the methanol extracts of the *D. esculenta* tuber using Wistar rats of both sexes (100 - 180 kg) when compared to that of the positive control (acetylsalicylic acid, 150 mg/kg) and negative control-normal saline (0.9% sodium chloride) used demonstrated the activity of the extract using carrageenan-induced oedema in the right hind paw (Table 1). In the first and second hours of application there was an appreciable increase in the anti-inflammatory activity for 100 mg/kg and 150 mg/kg doses. However, the 200 mg/kg

dose gave a lower inhibition effect. After the second hour, there was a continuous decrease in the activity for the 100 -180 mg/kg doses until the fifth hour of evaluation. There was also a gradual increase in the activity in the 200 mg/kg dose before it started declining till the fifth hour as well.

This result indicated that the yam species has anti-inflammatory activity. It seems the anti inflammatory property is short lived and one may suggest this action is quickly metabolized and removed from the system after reaching its peak in 2 h. This activity is optimally active at doses between 100 mg/kg and 150 mg/kg in the present study.

A number of adverse effects have been associated with the use of aspirin and other non-steroidal anti-inflammatory drugs. This necessitates the need to source newer compounds from natural products with less or no adverse effects. The tuber of *D. esculenta* may provide a possible source for the discovery of anti-inflammatory agents.

ACKNOWLEDGEMENTS

Financial support for this study was from the University of Ibadan senate research grant, SRG 2000/25A, awarded to Ajaiyeoba, EO. We are also grateful to Miss Olowu, F. O. for technical assistance.

REFERENCES

- Aderiyebi BI, Ogundana SK, Adesanya SA, Roberts MF (1996). Antifungal Properties of Yam (*Dioscorea alata*) peel extract. *Folia Microbiologica (Praha)*. 41(5): 407–442.
- Ajaiyeoba EO, Onocha PA, Nwozo SO, Sama W (2003). Antimicrobial and cytotoxicity evaluation of *Buchholzia coriacea* stem bark. *Fitoptera* 70: 184–186.
- British Herbal Pharmacopoeia (1983). ISBN 0-903032 – 07 – 4. British Herbal Manufacturers Association (B.H.M.A)
- Hess SM, Milonig RC (1972). Assay for inflammatory drugs: In Lepow IH, Ward PA (eds) *Inflammation, Mechanisms and control*, Academic Press, New York. pp. 1–12.
- Iwu MM, Okunji CO, Akah P, Tempesta MS, Corkey D (1990). Dioscoretine, the hypoglycemic principle of *Dioscorea dumetorum*. *Plant Med.* 56: 119–120.
- Krochmal A, Connie (1973). *A guide to the medicinal plants of the United States*. Quadrangle, the New York Times Book Co. 1973. ISBN No 0 –8129 –0261-0.

- Lassack EV, McCarthy TM (1983). Australian Medicinal Plants, Methuen, North Ryde, NSW. pp. 186.
- Olajide OA, Awe SO, Makinde JM, Ekhelar AI, Olusola A, Morebise O, Okpako DT (2000). Studies on the anti-inflammatory, antipyretic and analgesic properties of *Alstonia boonei* stem bark, J. Ethnopharmacol. 71: 179-186.
- Olajide OA, Makinde JM, Awe SO (1999). Effects of the aqueous extract of *Bridelia ferruginea* stem bark on Carrageenan-induced oedema and granuloma tissue formation in rats and mice. J. Ethnopharmacol. 66: 113-117.
- Olajide OA, Oladiran OO, Awe SO, Makinde JM (1998). Phytother. Res. 12: 364.
- Sofowora A (1993). Medicinal Plants and Traditional medicine in Africa. Spectrum Books Limited Nigeria.
- Trease GE, Evans WC (1983). Pharmacognosy ELBS, University Press pp. 832 Medica. 56: 119 – 120.
- Winter CA, Ristey EA, Nuss GW (1962). Carrageenan-induced oedema in the hind paw of the rats as an assay for anti-inflammatory drugs. Proc. Soc. Exp. Biol. Med. 111: 544.