EFFECT OF DRYING METHOD AND VARIETY ON FUNCTIONAL PROPERTIES OF TRIFOLIATE YAM (*Dioscorea dumentorum*) FLOUR

*ADEBOWALE, A.A[1], IJEOMA, U.A [1], ADEGUNWA, M. O[2], and BAKARE, H.A[2]

Departments of [1]Food Science and Technology; [2]Foodservice and Tourism,

Federal University of Agriculture, Abeokuta, Nigeria

* Corresponding author: (rasaq_adebo@yahoo.com)

INTRODUCTION

Yam (Dioscorea spp.) is not only a staple food and income generating crop in Nigeria; it also enjoys many social values

- In some West African communities, the size of yam farm and volume of output (quantity of tubers) is used to assess the wealth of the owner/ farmer.

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- Some yam varieties are widely known and overexploited for food, while many other varieties are exploited as food only in a few rural communities in Nigeria

- Trifoliate yam (Dioscorea dumetorum) is known by various names including three leaved yam, bitter yam and cluster yam.

- The tuber skin is coarse; one plant usually produced a cluster of tubers.

- Trifoliate yam is high yielding compared to other yam species.

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- *D. dumetorum* starch granules are smaller, more soluble and more digestible than those of other yam species
- The tubers are rich in protein (9.6%), and reasonably balanced in essential amino acids (chemical score of 0.94) compared to white yam.
- It is also rich in vitamins and minerals.
- Despite the nutritional advantages of trifoliate yam; it is one of the numerous tropical tubers that are yet to be fully exploited and is fast being driven to extinction.

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- A major limitation to its use is the tuber hardening which begins a few hours after harvest thus becoming hardened and hard to chew even after long hours of cooking.
- The goal of this study was to find convenient means of adding value to trifoliate yam by processing into flour for use as industrial raw materials.
- The tubers of trifoliate yam, when properly processed, can be used in the production of yam flakes; instant flour for the bakery sector or starch in diverse pharmaceutical preparations

MATERIALS AND METHODS

Freshly harvested yellow and white flesh trifoliate yam (*Dioscorea dumentorum*) was purchased from Kuto market in Abeokuta, Ogun State, Nigeria.

Processing of Trifoliate Flour (Abiodun et al 2010)

Trifoliate yam tubers

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Peeling & Washing

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Slicing

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Drying

sundrying (48-72 h); solar dryer (48-72 h); oven dryer (40 °C, 48 h); cabinet dryer (40 °C, 48 h).

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Milling

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Sieving

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Packaging

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Trifoliate yam flour

Determination of functional properties

Particle size distributions (AOAC, 2000);

Bulk density (Wang and Kinssela, 1976);

Dispersibility (Kulkarni *et al.*, 1991);

Water absorption index (Ruales *et al.*, 1993);

Emulsification capacity (Padmashree *et al.*, 1987);

Foaming capacity (Nwosu *et al.*, 2010); and

Oil absorption capacity (Sosulki *et al.*, 1962)

Pasting properties (RVA)

RESULTS AND DISCUSSION

Table 1. Effect of drying method and variety on some functional properties of trifoliate yam flour

Drying method	Variety	BD (g/ml)	Disp %)	WAI (%)	WBC (%)	FC (%)	OAC (%)	pH	EC (%)
sun drying	Yellow	0.68	48.67	153.87	11.47	10.00	125.00	6.60	50.67
	White	0.76	39.67	157.07	8.27	12.00	119.00	5.77	47.33
solar dryer	Yellow	0.69	50.33	135.47	8.27	11.33	129.67	6.65	45.33
	White	0.71	42.67	154.93	11.47	12.67	119.67	5.90	44.00
cabinet dryer	Yellow	0.66	19.67	144.53	7.20	8.67	125.00	6.14	45.33
	White	0.67	16.67	189.87	10.40	10.67	136.67	5.85	45.00
oven dryer	Yellow	0.73	27.67	167.20	12.53	13.33	120.33	6.05	43.00
	White	0.71	21.67	147.20	10.93	12.00	118.33	5.79	43.33
p of drying method		*	*	*	ns	ns	*	*	*
p of variety		*	*	*	ns	ns	ns	*	*
p of drying method × variety		*	*	*	ns	ns	*	*	*

BD = Bulk density; Disp = Dispersibility; WAI = Water absorption index; WBC = Water binding capacity; FC= Foaming capacity; OAC = Oil absorption capacity; EC = Emulsification capacity

Table 2: Effect Of drying method and variety on particle size distribution of trifoliate yam flour

Drying method	Variety	Coarse		Medium	Fine	
		250 µm	180 µm	106 µm	90 µm	Base
sun drying	Yellow	0.40	25.30	55.69	12.55	6.03
	White	0.68	23.41	32.21	22.85	20.85
solar dryer	Yellow	0.53	17.03	57.65	18.51	6.28
	White	0.76	11.41	50.35	19.94	17.54
cabinet dryer	Yellow	0.46	7.52	49.58	21.90	20.54
	White	0.48	11.07	54.74	18.01	15.36
oven dryer	Yellow	0.28	8.68	28.21	19.69	43.14
	White	0.68	10.85	55.99	17.87	14.62
P of drying method		*	*	*	*	*
P of variety		*	*	ns	*	*
P of drying method × variety		*	*	*	*	*

Table 3: Effect of drying method and variety on pasting properties of trifoliate yam flour

Drying method	variety	Peak (cp)	Trough (cp)	Break-down (cp)	Final viscosity (cp)	Setback (cp)	Peak time (s)	pasting temp (°C)
sundrying	Yellow	1997.5	1276.5	721.0	2207.5	931.0	4.9	86.5
	White	1502.5	945.5	557.0	1736.0	790.5	4.8	85.6
solar dryer	Yellow	1601.0	969.0	632.0	1809.5	840.5	4.9	87.4
	White	1455.5	770.5	685.0	1426.0	655.5	4.9	86.5
cabinet dryer	Yellow	1792.0	1113.5	678.5	2007.5	894.0	5.0	87.7
	White	1066.5	684.5	382.0	1385.0	700.5	5.0	87.7
oven dryer	Yellow	1560.0	1127.0	433.0	2052.0	925.0	5.1	88.9
	White	2258.5	1171.5	1087.0	1912.5	741.0	4.8	68.5
p of drying method		*	*	ns	*	*	ns	ns
p of variety		*		ns	*	*	*	ns
p of drying method × variety		*	*	*	*	ns	ns	ns

CONCLUSION

The study showed that most of the functional properties of trifoliate yam flour were significantly influenced by tuber variety and drying methods.

The data on functional properties of the flour reported will serve as useful baseline information for breeders and commercial utilization of trifoliate yam flour for food and non-food purposes.

POLICY RECOMMENDATIONS

- ✓ Need to strengthen collaboration between R&T breeders working on trifoliate yam and postharvest scientist.
- ✓ Breeding programs or interventions should incorporate end use characterization.
- ✓ Increased awareness on the nutritional and organoleptic advantages of trifoliate yam.
- ✓ Need to do more study on value addition and/or product development from trifoliate yam.

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