Chemical Control of Sprouting in Water Yam (D.alata) and their Effects on Product Quality

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Statement of the problem : Post harvest losses still persist in spite of methods to control them. Effective biochemical methods can result to changes in culinary properties. Sprout suppressants are not quite effective because yam tubers do not have pre-formed buds. Excessive water loss during storage results in drying out, potentially causing severe damage if not total loss of tubers. Losses due to spoilage agents in yam are estimated to over 50% in storage. There is dearth of information on the biochemical control of sprouting in water yam (D.alata) and their effect on product quality. The objectives were to improve the storage potential of D. alata using some biochemical sprout control methods, and to evaluate some physicochemical qualities of tubers during storage. The variety used in the study was UM 680. Biochemical products such as Gibberellic acid (GA3), Neem kernel extract (NM) and Peppermint oil (PM) were used. Untreated yam tubers were used a control.Yam tubers were grouped in sizes as small (SS) (≤ 0.5 Kg) , medium (MS) (0.6-0.9 Kg) and big size (BS) (≥ 1.0Kg).Findings:Physicochemical parameters determined showed that temperature of the storage environment ranged from 26.90 ± 0.00 to 27.86 ±1.00 °C while relative humidity ranged from 77.96 ±0.10 to 85.85 ±0.02 %. Sprout count (Figures 1) showed that dormancy lasted for 8 weeks across the three tuber size. The lowest sprout count was in the order GA3<nm<pm<c. There were no severe rots on the treated tubers after 20 weeks of storage. Weight loss (WT) and dry matter (DM) across tuber size and treatment increased as storage period increased. There was a significant difference ($p<0.05$) in WT and DM across tuber size. DM in BS tubers was highest (34.15 %) and lowest in that of SS tuber (32.04 %). Starch yield was significantly ($p>0.05$) highest in untreated tubers before storage (23.46 %) and lowest in treated tubers during 20 weeks storage. Increase in storage period caused a decrease in starch yield. Starch has been shown to change in a definite manner through dormancy and sprouting. Amylose was highest in MS tuber (10.17 %) and lowest in BS tuber (9.91 %). There was a significant difference ($p>0.05$) in amylose across tuber size. Total reducing sugar (TRS) was determined in tubers treated with only GA3 treatment as they recorded lower sprout count when compared with other treatments used in the study. TRS among tuber size was highest in MS tubers (1.90 %) and lowest in BS tubers (1.20 %),).

There was a significant difference ($p>0.05$) in TRS. Bulk density (BD) amongst tuber size and across varieties was significantly different ($p<0.05$). Generally BD during storage was highest in the medium sized tubers. The low BD of some of the flour samples can be suitable for formulation of high nutrient density weaning food. Water absorption capacity (WAC) was generally high. The ability of starch to absorb water is an indication of its moisture stability that is very important for food industry. This makes UM 680 suitable and can be recommended in food formulation. The study showed that GA3 treatment was most effective as a means of controlling sprouting on stored yam tubers of UM 680 (D.alata) while maintaining product quality. Storage period of tubers across sizes and treatments was 20 weeks. Gibberellic acid has been shown to have a non toxic mode of action in target plants. Studies shows that three acute oral toxicity (500, 1000 and 2000 mg/kg) GA3 for birds were low in acute toxicity. The report by Mallard Duck has been identified as the critical study for the risk assessment. Comparing with the 150mg/L used in the study, lethal dose (LD50) value which can be in excess of 2000 mg/kg showed no observed side effect on concentration. Therefore, Gibberellic acid (GA3) is a naturally occurring plant growth regulator which is safe to use.

Biography

Hussein Adinoyi Etudaiye is a product of life's Food Chemistry and Food Storage Technology. Hussein works at National Root Crops Research Institute (NRCRI), Umudike, Abia State, Nigeria. He was the Head of Otobi Substation (2017-2022). Hussein is presently the Head of Biochemistry unit and Assistant Coordinator, Yam Programme of the institution. He is Root and Tuber Crops Post Harvest Specialist and Food Chemist. He has 23 years cognate experience in Root and Tuber Crops Research, with focus on Production, Processing, Value Addition, Storage, Utilization, Quality control and Market Development. He is a Professional member of the Nigerian Institute of Food Science and Technology and International Society for tropical Root Crops (ISTRC).