بسم الله الرحمن الرحيم

Nutritional Composition of Six Selected Traditional Sudanese Fruits to Develop Non-Dairy based Fermented Carrier for A probiotic *Bifidobacterium infantis 20088*

التركيب الغذائى لستة انواع مختارة من الفاكهة التقليدية السودانية لتطوير منتجات مخمرة غير لبنية تحاملة باكتيريا الانفانتس الصديقة بروبيوتيك))

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Dedication

I dedicated this dissertation

To soul of my great parents Salah and Zahera.

To my aunts, uncles, sisters, brothers and all members of my big family for their kind help and support.

To my great husband and my kids for their patience and understanding.

It also goes to teachers, scientists, researchers, and all seekers for knowledge.

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LIST OF ABREVIATIONS

GIT	Gastrointestinal Tract
WHO	World Health Organization
Log	logarithm
CFU	Colony Forming Unite
%	Percentage
g	gram
β	Beta
DP	degree of polymerization
N	Normality
TSS	total soluble solid
h	hour
MRS	de Mann_Rogosa_Sharpe
˚C	degree Celsius
et al	et cetera (and company)
ANOVA	Analysis of variance
HPLC	High performance liquid chromatography
ml	milliliter

w/w weight per weigh

ABSTRACT

This study was carried out to determine the chemical composition of six selected traditional Sudanese fruits [Aradaib (*Tamarindus indica*); Doum (*Hyphaenethebaica*; Godim (*Grewia tenax)*; Gunguleiz *(Adansonia digitata*); Lalob (*Balanitesa gyptiaca)*; and Nabak (*Ziziphusspina christi*)] to develop probiotic fermented beverages. The results on showed that carbohydrates ranged from a minimum of 63.8% in Godim to a maximum of 80.9% in Nabak. Moreover Godim and Doum were the highest sugar and fiber content therefore, they were used for fermentation with *Bifidobacterium infantis20088*. The viable counts of the strain and physiochemical changes during fermentation and refrigeration storage were also determined. Reconstituted skim milk was used as control. The results obtained on fermentation revealed that the highest growth of *B. infantis20088* during fermentation was in Godim beverage (8×10^{9}) , followed by reconstituted skim milk(1.9×10^{8}) and then fermented Doum (1.5×10^{8}). That is because Godim contained the highest level of glucose as compared to skim milk and Doum fruit. In general there was significant increase in maximum viable count of each strain as

compared with its initial level in all fermented beverages. The increased viable number was accompanied by a reduction in pH and total soluble solids (TSS) by extended fermentation period. During the refrigeration storage of the fermented beverages there was no significant reduction in *Bifidobacterium infantis 20088* of all fermented beverages. Hopefully the strain was maintained high; fulfill the number required to presence in probiotic foods, which was 7 log CFU/ml fermented product. Therefore godaim and Doum are suitable carrier to deliver *bifidobacterium infantis 20088* to consumer at the same time the fermented beverages provide other essential nutrients such as protein, ash and fiber.

ملخص البحث

أجري هذا البحث لتقدير التركيب الكيميائى لستة انواع مختارة من الفاكهة التقليدية السودانية (عرديب – دوم – قضيم – لالوب - قنقليز والنبق) وذلك لتطوير عصائر مخمرة بالباكتيريا الصديقة (بروبايوتك). نتائج التحليل التقريبى للثمار اوضحت ان مستوى الكربوهيدريتات يتدرج من ادنى مستوى 63.8 % فى القضيم الى اعلى مستوياتة فى النبق بنسبة 80.9%. بالاضافة لذلك القضيم والدوم احتويا على اعلى النسب من السكريات والالياف لذلك استخدمت للتخمير بنوع الباكتيريا الصديقة انفانتس.

وتم حساب عدد باكتيريا انفانتس والتغيرات الفيزيوكيميائية اثناء عملية التخمير والتخزين فى الثلاجة. النتائج التى تم الحصول عليها من عملية التخمير اوضحت ان اعلى نمو لباكتريا الانفانتس كانت فى عصير القضيم ثم اللبن المنزوع الدسم المعاد تكوينة ومن ثم الدوم. وهذا يعود الى ان القضيم احتوى على اعلى نسبة من الجلكوز مقارنة باللبن المنزوع الدسم المعاد تكوينة والدوم.

وبصورة عامة هنلك زيادة معنوية فى النمو الميكروبى عند اقصى نمو لباكتيريا انفانتس فى العصائر المخمرة عند مقارنتة بعددها عند بداية عملية التخمير. وهذة الزيادة المعنوية فى نمو باكتيريا الانفانتس كانت مصحوبة بانخفاض فى الرقم الهايدروجينى (pH) والجوامد الصلبة الذائبة الكلية مع تقدم عملية التخمير.

واثناء عملية التخزين فى الثلاجة للعصائر المخمرة بباكتيريا الانفانتس فان ذلك لم يؤدى لتخفيض معنوى لعدد الباكتيريا المرغوبة. هذا العدد العالى لباكتيريا الانفانتس فى العصائر المخمرة يفى العدد المطلوب وجوده فى الاغذية التى تحتوى الميكروبات الصديقة وهى 10^7 خلية باكتيرية فى كل مل من المنتج المخمر. لذلك فان القضيم والدوم ملائمان لحمل باكتيريا الانفانتس للمستهلكين وفى نفس الوقت هذة العصائر المخمرة تقدم عناصر غذائية اساسية مثل البروتينات- الاملاح والالياف.