

ABSTRACT

Mona El-Sayed Youssef El-Sayed. Preparation of Some Special Weaning Foods. Unpublished Ph.D. Dissertation, Ain Shams University, Faculty of Agriculture, Department of Food Science, (2006).

This investigation was designed to prepare some special weaning formulas of high quality and low price, based on available local ingredients of vegetables, fruits, cereals, and legumes. Nine formulas were prepared, six of them for feeding diarrheal children, and the other three for feeding infants with iron deficiency anemia during weaning stage. These formulas were numbered from 1 to 6, and from 1 to 3, respectively.

The raw materials and the formulated weaning foods were analyzed for their chemical composition, the formulas were also exposed to microbial count, as well as biological and sensory evaluation.

Biological evaluation was carried out using sixty six white albino rats. For testing the prepared formulas, forty two rats were fed on control casein diet with added salamaca in water uptake to cause diarrhea, while, the other twenty four rats were fed on control diet free of iron to cause iron deficiency. The diarrheal and anemic rats were fed on the six tested antidiarrheal diets, and the other three prepared diets for iron deficiency anemia, respectively.

When testing the six formulas for feeding during acute diarrhea, formula 2 which contained high proportion of apple (40%), chick pea (25%), in addition of rice (12%), carrot (10%) and skim milk powder (13 %), was the most adequate one for stopping diarrhea. It stopped the watery stool at the 2nd day after feeding compared to the control and other diets

which stopped diarrhea after 3 to 4 days. This formula characterized by the highest content of protein, tannins, pectins, sodium, potassium, caloric value, PER, and the lowest lipids and moisture content.

Among the three prepared formulas for feeding anemic infants, formula 1, that composed of 41% chick pea, 22% guava, 20% defatted soya flour, 12% rice and 5% carrot was the most qualified formula for anemic children. It had the highest protein and iron content, as well as the essential amino acids leucine and phenylalanine + tyrosine. On feeding anemic rats on this formula, it corrected the iron deficiency and induced the highest hemoglobin, hematocrit, white blood cells, red blood cells, and iron concentrations in their blood after 21 days of feeding.

Additionally, these two aforementioned weaning formulas were the most preferable by the panelist in all quality attributes.

Key words: Acute diarrhea, Anemia, Hematocrit, Hemoglobin, Iron deficiency anemia, Red blood cells, Sensory evaluation, Weaning formula, White blood cells

CONTENTS

	page
List of appreciation.....	iii
List of tables.....	iv
List of figures.....	vi
1. Introduction	1
2. Review of literature	6
2.1 Diarrheal Diseases	6
2.1.1. Magnitude of the problem in Egypt.....	7
2.1.2. Types of Diarrhea.....	8
2.1.3. Causes of diarrhea (Etiology).....	8
2.1.3.1 Microbial organisms.....	8
2.1.3.2 Lactose intolerance.....	9
2.1.3.3 Feedings problems.....	9
2.1.4. Pathophysiology of diarrhea.....	9
2.1.5. Complications of diarrhea.....	10
2.1.6. Management of diarrhea.....	12
2.1.6.1 Prevention of diarrhea.....	12
2.1.6.2 Treatment of diarrhea.....	13
2.1.6.3 Feeding during diarrhea.....	15
2.1.7. Type of feeding.....	16
2.1.7.1 Breast Feeding.....	16
2.1.7.2 Weaning food.....	18
2.1.8. Infant nutritional needs.....	21
2.1.9. Different formulas used during diarrhea.....	21
2.2. Anemia.....	23
2.2.1. Classification of anemia.....	25
2.2.2. Iron deficiency anemia.....	25
2.2.3. Iron function.....	29
2.2.4. Iron distribution.....	30
2.2.5. Iron requirements.....	31
2.2.6. The symptoms of iron deficiency.....	31
2.2.7. Iron absorption.....	33

2.2.8.	Factors affecting iron absorption.....	34
	ii	
2.2.8.1	Effect of phytic acid.....	35
2.2.8.2	Effect of organic acids.....	37
3.	MATERIALS AND METHODS.....	40
3.1.	Materials	40
3.2.	Methods.....	41
3.2.1.	Preparation of raw materials.....	41
3.2.2.	Preparation of weaning food formulas.....	41
3.2.3	Preparation of weaning diets.....	44
3.2.3.1	Control diet.....	44
3.2.3.2	Experimental diets.....	44
3.2.4.	Biological experiments.....	44
3.2.4.1	Experiment on diets for acute diarrhea.....	44
3.2.4.2	Experiment on diets for iron deficiency anemia.....	47
3.2.5.	Analytical Methods.....	47
3.2.5.1	Proximate composition.....	47
3.2.5.2	Caloric value.....	47
3.2.5.3	Minerals determination.....	47
3.2.5.4	Tannins determination.....	50
3.2.5.5	Pectins determination.....	50
3.2.5.6	Amino acids determination.....	51
3.2.5.7	Chemical score.....	52
3.2.5.8	Biological evaluation.....	53
3.2.5.8.1	Body weight and weight gain	53
3.2.5.8.2	Protein Efficiency Ratio (PER).....	53
3.2.5.8.3	Blood analysis.....	53
3.2.5.8.3.1	Blood sampling.....	53
3.2.5.8.3.2	Hemoglobin determination.....	54
3.2.5.8.3.3	Hematocrit determination.....	54
3.2.5.8.3.4	Red blood cells and white blood cells.....	55
3.2.5.8.3.5	Serum iron determination.....	55

3.2.5.9	Microbiological examination.....	55
	iii	
3.2.5.9.1	Sample preparation.....	56
3.2.5.9.2	Total plate count detection.....	56
3.2.5.9.3	Yeast and molds detection.....	57
3.2.5.9.4	Coliform group detection.....	57
3.2.5.10.	Sensory evaluation.....	57
3.2.5.11.	Statistical analysis.....	58
4.	Results and discussion.....	53
PART 1	53
4.1.	Chemical composition of raw materials.....	58
4.1.1.	Proximate composition.....	58
4.1.2.	Minerals content.....	60
PART 2	63
4.2.	Weaning formulas for infants with acute diarrhea.	63
4.2.1.	Chemical composition of formulas.....	63
4.2.1.1	Proximate composition.....	63
4.2.1.2	Amino acids composition.....	66
4.2.1.3	Minerals content.....	68
4.2.2.	Microbial counts.....	70
4.2.3.	Biological evaluation.....	73
4.2.3.1	Body weight and weight gain	73
4.2.3.2	Protein efficiency ratio.....	79
4.2.3.3	Serum parameters.....	79
4.2.3.4	Internal organs weight.....	79
4.2.4.	Sensory evaluation.....	84
PART 3	88
4.3.	Weaning formulas for infants with iron deficiency anemia.....	88
4.3.1.	Chemical composition of formulas.....	88
4.3.1.1	Proximate composition.....	88
4.3.1.2	Amino acids composition.....	90
4.3.1.3	Minerals content.....	94

4.3.2.	Microbial count.....	96
	iv	
4.3.3.	Biological evaluation.....	99
4.3.3.1	Body weight and weight gain	99
4.3.3.2	Protein efficiency ratio.....	102
4.3.3.3	Blood hemoglobin and hematocrit.....	102
4.3.3.4	Red blood cells, white blood cells, and serum iron.....	108
4.3.3.5	Internal organs weight.....	111
4.3.4.	Sensory evaluation.....	113
5	Summary.....	117
6	References.....	124
	Arabic summary.....	

LIST OF ABBREVIATIONS

%	Percent
A.G.A	Anhydrogalactoronic acid
A.O.A.C	Official Methods of Analysis
BMs	Bowel movements
B.W	Body weight
C.B.C	Complete blood count
c.f.u	Colony forming unit
C.S	Chemical score
Co.	Company
D	Day
EAA	Essential amino acids
EAEC	Entero adherent <i>E.coli</i>
EPEC	Entero pathogenic <i>E.coli</i>
EPO	Erythropoietin
ETEC	Entero toxigenic <i>E.coli</i>
FAO	Food and Agriculture Organization
g	gram
G.W	Gain weight
HGB	hemoglobin
HCL	Hydrochloric acid
HCT	hematocrit
Hr	Hours
IDA	Iron deficiency anemia
Iu	International unit
Kcal	Kilocalory
kg	Kilogram
L	litter
L.C	Liquid chromatography
M CDS	Milk-based cereal drinks
M mol	millimol
Mg	Milligram
min	Minute
ml	Milliliter

mm	Millimeter
N	normal
NEAA	Non essential amino acids
NFE	Nitrogen free extract
nm	nanometer
°C	Degree Centigrade
P.P.M	Part per million
PER	Protein efficiency ratio
RBC	Red blood cells
RDA	Recommended daily allowances
sec.	Second
SPSS	Statistical package for social science
T.B.C	Total bacterial count
T.P.C	Total plat count
temp.	Temperature
UNU	UNICEF
v	volume
v-Hcl	Vanilline hydrochloride acid
WBC	White Blood Cells
WHO	World Health Organization
wk	week
μEq	milliequivalent
μl	microliter
μm	micromole