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~~APPENDIX IV-d~~

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SUBSTANTIVE PROGRESS REPORT
AID Contract ta-C-1286
CLINICAL ASSAY OF HIGH PROTEIN FOODS
January 1, 1976 - February 28, 1978

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SUMMARY OF TRIP TO THE PHILIPPINES - February 13-25, 1978

I. RESEARCH CARRIED OUT DIRECTLY UNDER CONTRACT AID/ta-C-1286

A. THRIPOSHA

Thriposha is a food blend designed for use in feeding programs for preschool children. Based on a blend of wheat and soy (80%) and dehulled sorghum (20%), the product's development and preclinical testing were carried out in the Departments of Agricultural Engineering and Food Science and Nutrition, Colorado State University. The product was intended for distribution and use in Sri Lanka. Protein quality of the blend was compared with casein in short-term nitrogen balance studies. The ability of Thriposha to support linear growth and weight gain was assessed through long-term consumption studies. Work was begun under interim funding provided by the U.S. Department of Agriculture (Research Contract 12-17-04-8-1464-X) and completed under the AID research contract.

Nitrogen balance studies carried out in eight children with the protein (N x 6.25) in Thriposha providing 6.7% of energy showed significantly inferior apparent nitrogen digestibility in comparison with casein. Despite this, apparent nitrogen retention did not differ significantly from casein. There was, however, significantly greater nitrogen retention during the control period following Thriposha than during the control period that preceded Thriposha, suggesting some compensatory nitrogen retention following Thriposha consumption. Four additional children consuming diets in which the protein in Thriposha provided 8% of energy had satisfactory rates of growth during a three-month period. Overall evaluation of the product

suggested that it would be suitable not only for preschool children (for whom it was designed) but also for growing infants. Details of the methodology and complete results of this study are located in Appendix 1. This paper is in press in the Ceylon J. of Child Health in Sri Lanka.

B. RICE

A major nutritional goal of the rice breeding program at the International Rice Research Institute has been the improvement of rice protein content. Two varieties of non-glutinous rice were provided by IRRI for the assessment of protein quality. IR 32 is a conventional variety of rice with a protein content of 7.1%, IR 480-5-9 is a high protein variety that provides approximately 11.4% protein. Using isoenergetic-isonitrogenous diets in which rice protein (N x 6.25) provided 6% of energy, these two varieties of rice were compared with casein in short-term balance studies. Mean apparent nitrogen absorption from rice was approximately 78% of that from casein in the nine children studied. Apparent N retention was approximately 73% of that from the preceding casein control period. No statistically significant differences were found between the two varieties of rice but trends in nitrogen absorption, retention, rates of weight gain and stool energy losses suggested slight inferiority of the high protein variety. This would be more than offset by the 60% higher protein content were equal quantities of rice consumed.

A second set of studies was carried out with the two non-glutinous rices (IR 32 and IR 480-5-9) and a glutinous variety of rice, IR 29. Glutinous rice differs from non-glutinous varieties in the relative contents of amylose and amylopectin. Glutinous rices are stickier after cooking and are generally thought to be less digestible. Balance studies were carried out in which all three rices were consumed in equal quantities to provide 48% of total energy intake. Stool wet and dry weights, fecal fat, total fecal energy by bomb calorimetry and calculated fecal carbohydrate were compared among the three varieties of rice and with values obtained during consumption of a casein-soy-cottonseed oil-sucrose-cornstarch control diet. Overall digestibility of all three varieties of rice was excellent, equal or superior to that of the control diet. No differences of importance were found between the glutinous and non-glutinous varieties of rice. Full details of these studies are given in Appendix 2. This manuscript is being submitted for publication.

Fasting and postprandial plasma free amino acid determinations were also done during the studies of rice protein quality. Preliminary analysis of these data shows that plasma free amino acid fluxes following ingestion of rice protein are much less than those seen after consumption of wheat protein or animal protein. We believe this relates to the fact that rice is unique among cereals in that virtually all protein is present in protein bodies, with little soluble matrix protein. These protein bodies have been detected in the stools of children consuming rice-based diets

(Juliano, B.O., unpublished observations, IRRI). Despite the small changes in total amino acids and total essential amino acids, the deficiency of lysine in rice protein is still detectable by the use of postprandial amino acid determinations. The preliminary analysis of these results is presented more fully in Appendix 3.

C. CORN-SOY BLEND (CSB)

Three blends of corn-soy (developed at Colorado State University) have recently begun to be evaluated in Peru. CSB #1 is a blend of 70% dehulled, degermed corn and 30% dehulled soybean. Assessment of protein quality is underway. As in previous studies the protein (N x 6.25) in CSB #1 provides 6.4-6.7% of calories. This is achieved by the addition of a blend of soy-cottonseed (80:20) oil and sucrose. An isonitrogenous-isoenergetic casein control diet either precedes or follows. Balance studies are carried out during the last six days of minimum nine-day dietary periods. Three children have completed this study to date. These results are summarizes in Table I. Apparent nitrogen absorption and retention from CSB #1 were remarkably similar to those from casein. There was, however, a markedly slower rate of weight gain while consuming the CSB #1 based diet. This was especially true of #552, who lost weight while consuming CSB #1.

Two additional forms of CSB were submitted for assessment. CSB #2 contains 70% whole corn and 30% dehulled soybean; CSB #3, 70% whole corn and 30% whole soybean. The main interest in these products centers on digestibility. It was felt desirable to assess digestibility of the products relative to CSB #1 before further

development was undertaken. In these studies CSB 1, 2, and 3 are consumed to provide approximately 50% of energy in the diet. Apparent nitrogen absorption, stool wet and dry weight, fecal fat, and total fecal energy by bomb calorimetry are assessed. Preliminary data from the two children who have completed this study are shown in Table II. Fecal energy data is not yet available. No analysis of the results is possible at this time.

II. ADDITIONAL RESEARCH FACILITATED BY CONTRACT AID/ta-C-1286

The major emphasis of research in the IIN during the past two years has been on the use of staple foods (rice, noodles, potatoes) in the feeding of small infants and in the treatment of protein-energy malnutrition. Our goal has been to determine the relative protein quality of and the digestive tolerance to these staples. Studies of noodles have been carried out under a grant from NIH and have been facilitated by our current AID contract. The studies with potatoes (also primarily NIH funded) have helped to form the initial collaborative link with the International Potato Center in Lima.

A. STUDIES WITH WHEAT NOODLES

These studies have proceeded in three steps. Initial studies assessed the protein quality of noodles and the digestibility of diets in which noodles provided 25, 50 and 75% of energy. These were judged against a standard casein-based control diet that is standard for the unit. Once protein quality and digestibility were assessed, long-term consumption studies were undertaken to determine the ability

of diets providing 50% of energy as the staple to support linear growth and weight gain. Finally, the staple food was used in the early treatment phase of chronic diarrhea and malnutrition in conjunction with our usual casein-based formula in an effort to decrease the reliance on milk protein in the management of this condition.

1. Balance Studies

Studies were carried out using diets in which noodles provided 25%, 50% or 75% of energy. Casein was added to the 25% diet to bring % protein Kcal to 6.6%. The 50% diet provided all of 6.6% protein Kcal as wheat protein. The 75% diet provided 10% of energy as protein. Control periods of a casein-based diet at either 6.6 or 10.0% protein Kcal were interspersed. Nine-day dietary periods with six-day metabolic collections were sequenced so as to control for effects of order of the diets.

The study allows the comparison of nitrogen retention from diets in which wheat provides 50% or 100% of 6.6% protein Kcal with that from casein. In addition, the ability of a diet providing 10% of energy as wheat protein to support nitrogen retention was studied. Progressive changes in stool wet and dry weight, fecal fat and total fecal energy by bomb calorimetry were determined as noodle intakes were varied.

Analysis of variance, for which the studies were designed, has not yet been completed. Preliminary tabulations of the results are available and are shown in Table III. Apparent N absorption at all three levels of noodle intake approached values for casein.

Apparent N retention was expectly low when wheat provided all dietary protein. Retentions from the 25% noodle (+ casein) and 75% noodle (10% protein Kcal) diets was similar to the preceding casein control period. There was, however, compensatory N retention during the control period following the 75% noodle diet. Fecal fat excretions remained low at all three levels of noodle intake. Stool weight and fecal energy showed progressive increases as noodle intakes were increased.

2. Prolonged Consumption Studies

Four infants consumed diets in which noodles provided 50% of total calories. Protein content was adjusted from 6.7 to 8% of calories by the addition of casein. Additional carbohydrate and fat provided the remaining 48% of energy. Fecal collections for wet weight (boys only), dry weight, fecal fat and fecal energy were made periodically throughout the studies. Studies were assessed primarily on linear growth, weight gain and maintenance of serum albumin concentration.

Preliminary results of these studies are shown in Tables IV and V. The diets were well tolerated in all cases. Growth rates judged on previous experience with infants in this stage of recuperation were excellent. Serum albumin concentrations changed little. Fecal fat and fecal energy values (Table V) were similar to those seen during the short-term studies at the same level of intake.

3. Use of Noodles in Initial Recuperation of Malnourished Infants

Over the past 17 years more than 550 malnourished infants have been admitted to the IIN for treatment. We have constantly sought to improve the outcome of these infants. All infants and children receive the best care possible; there are no control groups. During the past several years we have tried to decrease the reliance on milk protein in the initial treatment of these infants. This is desirable since in most clinical settings, milk protein is available only in association with lactose, a disaccharide to which most of these children are intolerant. Our usual approach to the malnourished child is to begin with a diet of casein, sucrose and soy-cottonseed oil, plus all known vitamins and minerals. This diet is begun at a level of 25 Kcal/kg body weight/day and is then increased in 25 Kcal/kg increments as tolerated until adequate rates of weight gain are achieved. This usually requires 150-175 Kcal/kg/day. Having established the adequacy of 50:50 mixtures of casein and wheat protein in balance studies at critical levels of intake (6% protein Kcal) we have begun to use noodles in the initial treatment of severe malnutrition.

Five children have been treated with our usual casein-sucrose-oil formula to a level of 75 Kcal/kg day (8% protein Kcal). Additional increments of energy and protein have been made by the addition of noodles. In addition to the important clinical parameters of recovery assessed by the pediatricians caring for the children, short balance studies have documented the efficacy of such an approach. Summarized results of these studies are presented in

Table VI. Apparent nitrogen absorption and retention, fecal wet and dry weight, fecal fat and rate of weight gain are shown while consuming 75 Kcal/kg/day as the casein-based formula and are compared with the same parameters during the progressive addition of energy and protein as noodles. All five children eventually consumed 150 Kcal/kg/day, half as noodles. Two children required 175 Kcal/kg/day; 100 Kcal of this was provided as noodles. Apparent nitrogen retentions improved as expected during recuperation. With improved digestive function stool weights tended to decrease. A picture of constantly improving fat absorption also emerged, as is characteristic of recovery in these children. Rates of weight gain increased with increasing intakes and eventually were such that significant catch-up was occurring. All parameters attested to the fact that the diets were more than satisfactory in the treatment of these children. The fact that wheat noodles are well tolerated and digested even by the compromised host is reassuring and opens new avenues for the treatment of these children.

B. STUDIES WITH THE WHITE POTATO

The white potato is indigenous to Peru. With the development of the international agricultural centers it was logical that the International Potato Center should be located in Peru. Several years ago informal exchanges of ideas were begun with scientists at the I.P.C. At that time their help was enlisted in beginning a more careful assessment of the nutritional qualities of the potato, especially as it might have potential as a weaning food for infants.

As with studies with wheat noodles, our initial concerns revolved around protein quality for the human and digestibility of the potato in general.

To carry out accurate metabolic studies with potatoes required that large lots of potatoes from the same harvest be able to be stored and used over a number of months. To surmount problems of storage of large quantities in limited space and to facilitate diet preparation, pilot studies were carried out to see if nitrogen absorption and retention and stool weights while consuming fresh potatoes differed from those during consumption of potatoes from the same batch that had been either oven-dried or lyophilized. These balance studies (Table VII) showed no significant differences attributable to processing. As a result oven dehydrated potatoes supplied by the International Potato Center are now used for studies.

Study design for the evaluation of protein quality and overall digestibility parallels that outlined for noodles. Diets that provide 25%, 50% or 75% of energy as potatoes are compared with interspersed casein-based control diets. The 75% potato diet provides all nitrogen as potato protein. Progressive changes in stool weight and fecal energy are to be analyzed by analysis of variance. Partial results from the first three children in the balance studies with potatoes are shown in Table VIII. These early data suggest that potatoes may not be as digestible as noodles and may not be able to be consumed in as large quantities as noodles. Stool weights are also higher than those we have documented for rice-based diets.

Following completion of the balance studies in nine children, long-term consumption studies will be undertaken using diets in which potatoes provide 50% of energy. Depending on our experience at that time, potatoes will be begun to be used in the initial treatment of malnutrition and diarrhea.

C. "ALIMENTOS COMUNES"

We have recently completed a series of studies of the tolerance to and digestibility of diets based on staple foods commonly consumed in Peru - so called "alimentos comunes". These studies were undertaken to document in a controlled setting that diets using common foods from the local market (with an emphasis on vegetable sources of protein) could be used in the recuperation of malnourished infants. Plans were to use these diets in our outpatient malnutrition treatment center.

Seven diets were studied. All provided 10% of energy as protein. In five, 35% of protein was animal in origin; the remaining two had no animal protein. In six diets, potatoes and noodles in equal weight were mixed with one of five sources of additional protein: egg, milk, fish, liver, CSM or beans. The remaining diet consisted of oats and quinoa, a cereal indigenous to Peru. Diets were fed in random sequence in nine-day dietary periods with metabolic collections during the last six days.

There were no significant differences among the six potato-noodle diets in apparent absorption of nitrogen, stool weights or apparent nitrogen retention. Nitrogen absorption and retention from

the oats-quinoa diet was inferior. Furthermore, fat absorption from this diet was poorer. Further studies suggested that both the oats and the quinoa contributed to this. In the case of qunioa, "quinoa perlada", the dehulled ground grain used by most women in cooking, had been used in the studies. This was subsequently compared with a milled quinoa flour. Fat absorption from diets in which quinoa flour was used was significantly better than from diets containing quinoa perlada. Results of these studies are currently in press in Archivos Latinamericanos de Nutricion, (Lopez de Romaña, G., H. Creed and G.G. Graham: "Alimentos comunes" Peruanos: tolerancia y digestibilidad en infantes malnutridos).

Table I

Preliminary results of studies assessing the protein quality of CSB #1

Pt. No.[a]	No. Days C	No. Days CSB_1[b]	APPARENT N BALANCE Abs % C	Abs % CSB_1	Ret % C	Ret % CSB_1	FECAL WEIGHT Wet g/d C	Wet g/d CSB_1	Dry g/d C	Dry g/d CSB_1	Fecal Fat % Intake C	Fecal Fat % Intake CSB_1	Δ Wt g/kg/d C	Δ Wt g/kg/d CSB_1
547	11	9	82	79	44	41	54	90	9.6	16.8	7.2	4.9	11.5	5.4
548[c]	9	11	83	82	30	33	54	56	9.9	11.7	9.7	7.8	5.1	1.2
552[c]	9	9	69	66	21	21	146	141	20.5	25.5	21.9	10.8	1.5	-0.4

[a] #547: Age 5 mos., length 59.3 cm, weight 5630 grams.
#548: Age 11 mos., length 68.4 cm, weight 6660 grams.
#552: Age 13 mos., length 64.5 cm, weight 6000 grams.

[b] CSB #1 is a blend of 70% dehulled, degermed corn and 30% dehulled soybean. Protein (N x 6.25) in this diet provided 6.4% of energy and was compared isonitrogenously and isoenergetically with a casein-based control diet.

[c] These two children consumed CSB first in sequence.

Table II

Preliminary results of studies of digestibility of three corn-soy blends[a]

Pt. No.	APPARENT N ABSORPTION %			FECES Weight Wet - g/d			FECES Weight Dry - g/d			FECES Fat g/d		
	CSB_1	CSB_2	CSB_3	CSB_1	CSB_2	CSB_3	CSB_1	CSB_2	CSB_3	CSB_1	CSB_2	CSB_3
547	87	81	82	67	78	86	16.8	22.5	18.9	1.4	2.1	1.8
548	81	77	75	111	79	138	18.8	24.8	27.9	4.1	2.2	1.8
552			62			201			39.9			8.3

[a]

CSB #1: 70% dehulled, degermed corn, 30% dehulled soybean

CSB #2: 70% whole corn, 30% dehulled soybean

CSB #3: 70% whole corn, 30% whole soybean

CSB provided 50% of energy in all diets.

Table III

Summary of balance studies comparing diets in which noodles provided 25%, 50% and 75% of energy with a control diet. All comparisons were isonitrogenous-isoenergetic. C_1 refers to the preceding, C_2 to the succeeding casein control period. Values are mean ± S.D., n = 9

	APPARENT N ABS - %			APPARENT N RET - %			STOOL WET WT - g/d			FECAL FAT - g/d			FECAL ENERGY - Kcal/d		
	N	% C_1	% C_2	N	% C_1	% C_2	N	% C_1	% C_2	N	% C_1	% C_2	N	% C_1	% C_2
Noodles-25%[a]	85.8 ±2.3	98.9 ± 2.9	86.3 ±3.2	39.2 ±9.9	101.8 ±31.8	94.9 ±18.7	63.7 ±33.2	91.0 ± 16.8	78.1 ± 14.7	1.9 ±0.5	94.3 ±17.3	97.2 ±22.1	42.9 ±10.7	98.6 ± 15.1	86.8 ± 15.8
Noodles-50%[b]	81.4 ±3.1	96.0 ± 3.5	95.3 ±5.4	20.4 ±5.8	52.3 ±14.6	46.4 ±14.3	95.1 ±33.3	154.7 ±119.3	152.6 ±119.1	2.3 ±1.2	110.4 ±45.3	103.3 ±45.2	59.6 ±13.1	130.3 ± 43.9	139.6 ± 55.0
Noodles-75%[c]	84.7 ±3.5	97.6 ±10.4	93.7 ±4.5	33.3 ±6.2	102.8 ±29.6	75.7 ± 7.7	124.2 ±42.5	261.8 ± 90.4	170.3 ± 86.8	1.6 ±1.0	77.7 ±53.3	59.8 ±34.7	72.5 ±18.6	188.7 ±104.4	268.3 ±259.2

[a] Noodles provided half of 6.6% protein Kcal. Casein provided the remaining 50%.

[b] Noodles provided all of 6.6% protein Kcal.

[c] Noodles provided all of 10% protein Kcal.

Table IV

Progress of chronologic age, weight, weight age, height and height age, and changes of serum albumin concentration in four infants consuming diets in which noodles provided 50% of energy and 84% of protein for a three-month period

	INTAKE		INITIAL						CHANGE					
Pt. No.	Energy Kcal/kg/d	Protein g/kg/d	C.A. mos	WT g	W.A. mos	HT cm	H.A. mos	Alb g/d	C.A. mos	WT g	W.A. mos	HT cm	H.A. mos	Alb g/dl
529	125	2.5	13.0	7010	5.7	66.5	6.8	3.4	3.0	3090	8.3	6.7	4.7	+0.1
533	125	2.5	8.6	6580	4.8	67.8	7.6	3.5	3.0	2670	6.0	5.1	3.7	-0.1
535*	100	2.0	20.0	9270	10.9	71.0	9.8	3.8	3.4	2300	9.1	5.9	4.7	-0.1
540	110	2.2	18.9	8050	7.7	72.3	10.9	3.8	3.0	3150	10.9	4.0	3.1	+0.2

* Intakes reduced for one week due to intercurrent diarrhea.

Table V

Fecal weight, fat and energy values during long-term consumption of diets in which noodles provided 50% of energy

Pt. No.	Body Wt kg	INTAKE Energy Kcal/kg/d	INTAKE Protein g/kg/d	No. Study Days	FECES Wet Wt g/d	FECES Dry Wt g/d	FECES Fat g/d	FECES Energy Kcal/d
529	7.7	125	2.5	6	--	15.8	1.4	56.7
	8.8	125	2.5	6	--	15.7	1.6	54.6
	9.8	125	2.5	6	--	13.5	1.3	51.6
533	7.1	125	2.5	6	81	10.0	1.3	42.4
	8.3	125	2.5	6	115	12.0	0.9	44.5
	9.3	125	2.5	6	92	11.0	1.3	44.2
540	9.3	110	2.2	6	--	15.6	2.0	51.7
	10.6	110	2.2	6	--	12.2	2.5	62.2
	11.2	110	2.2	6	--	15.8	1.7	51.1
535	9.5	100	2.0	6	--	19.0	3.0	--
	11.6	100	2.0	6	--	12.6	1.3	--

Table VI

Results of balance studies during initial treatment of protein-energy malnutrition with diets adding progressive amounts of noodles to a basic 75 Kcal/kg as casein-sucrose and a cottonseed-soy oil blend

Pt. No.	Hosp. Days	APPARENT N BALANCE % Abs.	APPARENT N BALANCE % Ret.	FECAL WT Wet	FECAL WT Dry	FECAL FAT g/d	FECAL FAT % Int.	Δ Wt g/kg/d
Casein-based diet: 75 Kcal/kg/d (C-75)								
521	9-11	79	25	160	38.6	21.1	65.3	-3.2
545	8-10	76	--	51	4.1	1.5	10.0	-0.7
547	3- 5	79	16	57	7.4	4.6	31.0	-13.0
548	10-12	75	19	90	10.1	4.8	22.8	0.0
549	9-11	73	19	175	14.1	9.8	37.0	-5.0
C75 + Noodles: 25 Kcal/kg/d (N-25)								
521	12-13	80	34	213	45.0	21.0	54.0	0.0
545	11-13	78	23	77	7.3	3.0	14.8	2.6
547	6- 8	85	24	39	8.0	4.8	25.6	3.9
548	13-15	83	47	58	9.3	3.2	3.6	-8.2
549	12-20	79	16	109	14.6	8.3	22.9	6.1
C75 - N50								
521	14-16	88	47	161	35.9	16.1	33.9	2.7
545	14-16	81	37	49	7.4	2.5	9.9	9.4
	19-21	87	34	43	6.6	2.1	8.0	-3.3
547	9-14	78	25	47	9.6	3.7	15.3	6.6
548	16-18	80	35	95	15.3	4.4	12.7	3.2
	21-23	82	20	120	17.9	9.3	20.1	2.9
549	28-31	71	17	123	16.1	9.5	20.0	3.1

(Continued)

Table VI (Cont'd)

Pt. No.	Hosp. Days	APPARENT N BALANCE		FECAL WT		FECAL FAT		Δ Wt g/kg/d
		% Abs.	% Ret.	Wet	Dry	g/d	% Int.	
	C75 - N75							
521	18-20	85	34	101	19.9	7.0	14.5	10.0
545	22-24	86	35	40	7.6	2.3	7.1	11.4
547	15-17	77	27	103	11.7	2.5	8.3	5.4
	18-20	50	Neg.	109	14.8	3.4	11.5	3.5
548	19-21	87	38	82	12.4	2.3	5.5	2.6
549	32-34	77	20	171	25.5	9.0	16.0	3.7
	37-39	71	16	223	35.3	12.3	21.6	7.7
	C75 - N100							
547	21-23	80	38	95	17.1	3.9	11.0	10.5
548	22-24	88	40	57	11.6	2.4	4.9	17.9

Table VII

Results of preliminary studies to determine effect of processing on apparent N digestibility and retention of potatoes. Results are mean ± S.D. (n=5)

	Apparent N Absorption %	Apparent N Retention %	Fecal Weight		Fecal Fat	
			Wet g/d	Dry g/d	g/d	% Intake
Fresh	76.8±4.3	34.0± 3.4	140±61	15.8±4.2	1.9±1.1	7.8±5.2
Dehydrated	73.6±5.4	37.7± 5.2	145±44	18.4±5.0	2.6±1.2	8.0±3.4
Lyophilized	72.6±7.4	35.4±10.5	125±40	20.0±8.7	3.1±1.5	9.0±1.4

Table VIII

Preliminary results of balance studies comparing data in which potatoes provided 25%, 50% and 75% of energy with a control diet. All comparisons are isonitrogenous (6.0% protein Kcal) and isoenergetic. C=Casein control diet. P=Potatoes.

Pt. No.	Apparent N Absorption %		Apparent N Retention %		Fecal Weight Wet g/d		Fecal Weight Dry g/d		Fecal Fat g/d		Fecal Fat % Intake	
	C	P	C	P	C	P	C	P	C	P	C	P
	Potatoes - 25%											
536	91		50		69		12.0		2.5		7.1	
538	86	83	39	44	126	129	12.4	13.1	2.7	1.7	9.7	6.1
542	91	84	46	47	93	143	13.9	20.1	1.4	2.1	5.9	5.2
	Potatoes - 50%											
536	85	78	45	40	131	188	16.4	25.0	4.1	1.8	12.5	5.2
538	91	82	52	48	95	170	11.0	18.5	2.0	1.3	6.9	4.5
542	90	87	37	46	101	203	12.1	18.2	1.6	1.5	4.5	4.6
	Potatoes - 75%											
536	89	64	45	32	76	226	13.2	36.1	2.2	1.9	6.8	6.0
538	81	63	38	26	132	273	11.8	25.8	3.2	1.5	12.4	5.5
542	88	68	41	36	104	291	14.3	31.3	2.0	2.2	5.6	5.9