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Appendix A

A1. Statistical analysis of F test (Wayne W.D 1978)

Results from Table 3

	I				II				III			
No. of exp.	^{14}C GlcNAc chased in sol^{n}				^{14}C GlcNAc remained root				Total			
	Sugar competitor				Sugar competitor				Sugar competitor			
	GlcNAc	ManN	GlcN	Glc	GlcNAc	ManN	GlcN	Glc	GlcNAc	ManN	GlcN	Glc
1	7.34	3.61	2.25	3.18	13.68	9.73	16.25	14.06	21.02	13.34	18.50	17.24
2	8.65	3.24	2.50	2.56	9.33	14.99	16.80	14.31	17.98	18.23	19.30	16.87
3	9.42	3.98	3.02	3.80	8.64	10.32	17.32	10.45	18.06	14.40	20.34	14.25
Total	25.41	10.83	7.77	9.54	31.65	35.04	50.37	38.82	57.06	45.87	58.14	48.36
Mean	8.47	3.61	2.59	3.18	10.55	11.68	16.79	12.94	19.02	15.29	19.38	16.12

	I	II	III
$CT = T_{..}^2/N$	238.9669	2024.8812	3655.0771
$SS_{total} = \sum_{j=1}^{k}\sum_{i=1}^{nj} X_{ij}^2 - CT$	69.38	107.7822	64.3184
$SS_{among\ gr} = \sum_{j=1}^{k} \frac{T_{.j}^2}{nj} - CT$	65.81	66.3366	37.8728
$SS_{within\ gr} = SS_{total} - SS_{among\ gr}$	3.57	41.4456	26.4456
$MS = SS/df$			
$F_{calc.} = MS_{treatmet}/MS_{exp.}$	49.16	4.27	3.82
Tabular F (3.8) = 7.59 ($\alpha = 0.01$)			
Interpretation	Sig. diff. among treatment	No difference	No difference

Example for calculation (I)

$$CT \text{ (Correction term)} = T_{ij}^2/N$$

$$= (25.41+10.83+7.77+9.54)^2/12 = 238.9669$$

$$SS_{total} \text{(Sum of square)} = \sum_{j=1}^{k} \sum_{i=1}^{nj} x_{ij}^2 - CT$$

$$= (7.34)^2+(8.65)^2+(9.42)^2+(3.61)^2\ldots+(3.80)^2-$$

$$238.9669 = 69.38$$

$$SS_{among\ groups} = \sum_{j=1}^{k} \frac{T_{\cdot j}^2}{nj} - CT$$

$$= \frac{1}{3}[(25.41)^2+(10.83)^2+(7.77)^2+(9.54)^2]-238.9669$$

$$= 65.81$$

$$SS_{within\ groups} = SS_{total} - SS_{among\ groups}$$

$$= 69.38 - 65.81$$

$$= 3.57$$

ANOVA table

Source of variation	Degree of freedom (df)	SS	Mean square (MS) = SS/df	F.ratio = $MS_{among\ gr}/MS_{within\ gr}$
among groups	(k-1) 3	65.81	21.9367	49.16
within groups	(N-k) 8	3.57	0.4463	
Total	(N-1) 11			

Tabular F (3.8) = 7.59 ($\alpha = 0.01$)

Since calculated F-ratio (49.16 is greater than tabular F (7.59), the means of sp.radioactivity in 4 different competitor sugar solutions are significantly different.

In order to compare different pairs of mean, Tukey's HSD (Honestly Significant Difference) Test was applied.

A2. Tukey's HSD Test (Wayne W.D 1978)

A multiple comparison procedure developed for testing the null hypothesis that all possible pairs of treatment means are equal. Tukey's test, which is usually referred to as the HSD (honestly significant difference) test, makes use of a single value against which all differences are compared. This value, called the HSD, is given by

$$HSD = q_{\alpha,k,N-k} \frac{MSE}{n}$$

From Table K; q (at $\alpha = 0.01$, $k = 3$, $N-k = 8$) = 5.64

$$HSD = 5.64 \frac{0.4463}{3}$$

$$= 2.18$$

Pair-being tested	Difference of mean	Interpretation
GlcNAc : ManN	4.86	significant difference
GlcNAc : GlcN	5.88	significant difference
GlcNAc : Glc	5.29	significant difference
ManN : GlcN	1.02	no significant difference
ManN : Glc	0.43	no singnificant difference
GlcN : Glc	0.59	no significant difference

If difference of mean is greater than HSD, that pair of mean is significant difference at $p < 0.01$

Appendix B

Amino acids composition of wheat germ agglutinin calculated by using pure amino acids as correction factor (I) and by using treated glutathione (oxidized form) as correction factor for cysteic acid, glutamic acid and glycine (II).

Amino acids	mol % recovery		
	Nagata 1974	I	II
Aspartic acid	9.0	8.8	8.3
Threonine	2.5	3.0	2.8
Serine	7.1	7.2	6.7
Glutamic acid	12.2	12.1	11.4
Proline	4.0	5.3	4.4
Glycine	24.3	22.2	21.4
Alanine	5.8	6.3	5.9
Cysteic acid	17.6	12.4	17.9
Valine	0.8	1.8	1.5
Methionine Sulfone	1.2	1.5	1.4
Isoleucine	1.2	1.5	1.4
Leucine	2.4	3.2	3.0
Tyrosine	4.3	3.6	3.6
Phenylalanine	1.8	2.2	2.1
Lysine	2.2	4.4	4.2
Histidine	1.0	1.3	1.2
Tryptophan	-	-	-
Arginine	2.7	3.0	2.8

BIOGRAPHY

Miss Jiraporn Limpananont was born on June 28, 1948 in Bangkok. She graduated with the degree of Bachelor of Sciecne (Hons. in Pharm.) from Mahidol University in 1972 and Master of Science (Biochemistry) from the same university in 1974. She has been working in the Biochemistry Department, Faculty of Pharmaceutical Sciences, Chulalongkorn University since 1974.