

Table (19): Percentage of amino acid contents per total amino acids for permethrin strain, thiodicarb strain and fenitrothion strain.

Amino acid	Permethrin St.F <sub>3</sub> %A.A. per total A. As.	Thiodicarb St.F <sub>4</sub> %A.A. per total A. As.	Fenitrothion St.F <sub>7</sub> %A.A. per total A. As.
Aspartic acid	9.349	9.519	9.637
*Threonine	4.338	4.883	5.165
Serine	3.873	4.246	4.289
Glutamic acid	11.740	12.049	13.073
Proline	7.045	6.630	4.781
Glycine	4.484	3.540	4.373
Alanine	6.576	6.810	6.150
Cystine	0.103	0.202	0.112
*Valine	7.323	7.165	7.076
*Methionine	2.423	2.369	2.429
*Isoleucine	5.913	6.459	5.455
*Leucine	7.006	6.552	7.135
Tyrosine	7.574	7.743	8.000
*Phenylalanine	5.258	5.602	5.593
*Histidine	3.753	3.856	3.875
*Lysine	7.115	6.802	6.649
*Arginine	6.129	5.576	6.209

\* Reported to be essential amino acids in the boll weevil by Vanderzant (1965).

The results in tables 20, 21, 22, 23 indicated that the amino acid which was calculated as percentage of protein gave less change or similar results which calculated as percentage of a dry weight basis for pupal tissue.

Protein constituents has been reported to be affected by various factors. Nattar et al. (1986) reported the fluctuations in total protein content and total amino acids of 4<sup>th</sup> and 6<sup>th</sup> instar larvae of S. littoralis after exposure to sublethal doses of either fenvalerate or chlorpyrifos.

Whereas El-Sheakh et al. (1990) showed the total crude protein was reduced while soluble protein increased after treating 4<sup>th</sup> instar larvae of Spodoptera littoralis with LC50 insecticides; Osbac, Cyanox and Soybean phytoalexins. They also showed many differences in the free amino acids between treated and untreated larvae.

It was found that cystine, lysine, histidine, serine, arginine, phenylalanine, glycine, methionine, tyrosine and leucine and / or isoleucine were decreased in larvae of S. littoralis treated with LC50 of Osbac. Also, histidine, methionine, lycine, phenylalanine, tyrosine and glycine were decreased in cyanox treated larvae. On the other hand aspartic, glutamic, threonine and alanine were increased in larvae treated with both insecticides.

Table (20): Amino acid contents of permethrin strain and susceptible strain (gram per 100 gram) on a dry weight basis for pupal tissue and protein .

Amino acid	Permethrin St. F <sub>2</sub>		Sus. St. F <sub>2</sub>	
	gm A.A./100 gm Sample	gm A.A./100 gm protein	gm A.A./100 gm Sample	gm A.A./100 gm protein
Aspartic acid	4.808	6.336	4.854	6.061
†Threonine	2.231	2.940	2.935	3.664
Serine	1.992	2.625	2.556	3.191
Glutamic acid	6.038	7.957	6.290	7.854
Proline	3.623	4.775	2.966	3.704
Glycine	2.306	3.040	2.190	2.734
Alanine	3.382	4.457	3.102	3.873
Cystine	0.053	0.070	0.072	0.088
†Valine	3.766	4.962	3.588	4.480
†Methionine	1.246	1.642	1.023	1.277
†Isoleucine	3.041	4.008	3.115	3.890
†Leucine	3.603	4.748	3.421	4.271
Tyrosine	3.895	5.133	3.650	4.558
†Phenylalanine	2.704	3.564	2.738	3.419
†Histidine	1.930	2.543	1.703	2.126
†Lysine	3.659	4.822	3.284	4.100
†Arginine	3.152	4.154	2.856	3.565

† Reported to be essential amino acids in the boll weevil  
by Vanderzant (1965)

Table (21): Amino acid contents of thiodicarb strain and susceptible strain (gram per 100 gram) on a dry weight basis for pupal tissue and protein .

Amino acid	Thiodicarb St. F <sub>4</sub>		Sus. St. F <sub>5</sub>	
	gm A.A./100 gm Sample	gm A.A./100 gm protein	gm A.A./100 gm Sample	gm A.A./100 gm protein
Aspartic acid	4.722	6.004	4.854	6.061
*Threonine	2.422	3.080	2.935	3.664
Serine	2.106	2.678	2.556	3.191
Glutamic acid	5.977	7.599	6.290	7.854
Proline	3.289	4.182	2.966	3.704
Glycine	1.756	2.233	2.190	2.734
Alanine	3.378	4.294	3.102	3.873
Cystine	0.100	0.127	0.072	0.088
*Valine	3.554	4.519	3.588	4.480
*Methionine	1.175	1.494	1.023	1.277
*Isoleucine	3.204	4.073	3.115	3.890
*Leucine	3.250	4.132	3.421	4.271
Tyrosine	3.841	4.883	3.650	4.558
*Phenylalanine	2.779	3.534	2.738	3.419
*Histidine	1.913	2.432	1.703	2.126
*Lysine	3.374	4.290	3.284	4.100
*Arginine	2.766	3.517	2.856	3.565

\* Reported to be essential amino acids in the boll weevil by Vanderzant (1965)

Selection by thiodicarb insecticide started in the second generation of the susceptible strain.

Table (22): Amino acid contents of fenitrothion strain and susceptible strain (gram per 100 gram) on a dry weight basis for pupal tissue and protein.

Amino acid	Fenitrothion St.F <sub>7</sub>		Sus. St.F <sub>7</sub>	
	gm A.A./100 gm Sample	gm A.A./100 gm protein	gm A.A./100 gm Sample	gm A.A./100 gm protein
Aspartic acid	4.892	5.970	5.074	6.326
*Threonine	2.622	3.200	2.933	3.657
Serine	2.177	2.657	2.373	2.958
Glutamic acid	6.636	8.098	6.117	7.628
Proline	2.427	2.961	3.209	4.001
Glycine	2.220	2.708	2.275	2.837
Alanine	3.122	3.809	3.434	4.282
Cystine	0.057	0.069	0.051	0.064
*Valine	3.592	4.384	3.358	4.186
*Methionine	1.233	1.504	1.208	1.506
*Isoleucine	2.769	3.378	3.036	3.785
*Leucine	3.622	4.419	3.489	4.350
Tyrosine	4.061	4.956	3.925	4.894
*Phenylalanine	2.839	3.465	2.737	3.413
*Histidine	1.967	2.401	1.775	2.213
*Lysine	3.375	4.119	3.602	4.491
*Arginine	3.152	3.846	2.913	3.633

\* Reported to be essential amino acids in the boll weevil  
by Vanderzant (1965)

Table (23): Amino acid contents of permethrin strain, thiodicarb strain and fenitrothion strain (gram per 100 gram) on a dryweight basis for pupal tissue and protein.

Amino acid	Permethrin st.F <sub>5</sub>		Thiodicarb st.F <sub>4</sub>		Fenitrothion st.F <sub>7</sub>	
	gm A.A./100 gm sample	gm A.A./100 gm protein	gm A.A./100 gm sample	gm A.A./100 gm protein	gm A.A./100 gm sample	gm A.A./100 gm protein
Aspartic acid	4.808	6.336	4.722	6.004	4.892	5.970
†Threonine	2.231	2.940	2.422	3.080	2.622	3.200
Serine	1.992	2.625	2.106	2.678	2.177	2.657
Glutamic acid	6.038	7.957	5.977	7.599	6.636	8.098
Proline	3.623	4.775	3.289	4.182	2.427	2.961
Glycine	2.306	3.040	1.756	2.233	2.220	2.708
Alanine	3.382	4.457	3.378	4.294	3.122	3.809
Cystine	0.053	0.070	0.100	0.127	0.057	0.069
†Valine	3.766	4.962	3.554	4.519	3.592	4.384
†Methionine	1.246	1.642	1.175	1.494	1.233	1.504
†Isoleucine	3.041	4.008	3.204	4.073	2.769	3.378
†Leucine	3.603	4.748	3.250	4.132	3.622	4.419
Tyrosine	3.895	5.133	3.841	4.883	4.061	4.956
†Phenylalanine	2.704	3.564	2.779	3.534	2.839	3.465
†Histidine	1.930	2.543	1.913	2.432	1.967	2.401
†Lysine	3.659	4.822	3.374	4.290	3.375	4.119
†Arginine	3.152	4.154	2.766	3.517	3.152	3.846
Total	51.429		49.606		50.763	

† Reported to be essential amino acids in the boll weevil by Vanderzant (1965).