Phytochemistry, 1980, Vol. 19, pp. 137–138. Pergamon Press Ltd. Printed in England. 0031-9422/80/0101-0137 $02.00/0

SHORT REPORTS

AMINO ACIDS IN CREAM AND YELLOW ANTHERS OF *GOSSYPIUM HIRSUTUM*

BARBARA W. HANNY and C. DENNIS ELMORE
USDA-SEA-AR, Cotton Physiology and Genetics Laboratory, Stoneville, MS 38776, U.S.A.

(*Received* 15 *April* 1979)

Key Word Index—*Gossypium hirsutum*; Malvaceae; cotton; amino acids; anthers; insect feeding.

INTRODUCTION

The tobacco budworm larva (*Heliothis virescens* F.) is a serious, economically devastating pest of cotton (*Gossypium hirsutum* L.). Research has shown that developing cotton anthers are the primary source of nutrients for this larva [1]. Tobacco budworm larvae fed developing yellow colored cotton anthers have been reported to weigh significantly less (15%) than larvae fed developing cream anthers [2]. The chemical basis of larval growth suppression by yellow anthers is currently under investigation at this laboratory. Possible differences in total and free amino acids of developing yellow and cream anthers were considered first because they are among the most important nutrients for the larvae.

RESULTS AND DISCUSSION

Results of amino acid analyses of developing cream and yellow colored anthers from five cotton strains are presented in Table 1. With the exception of the two non-protein amino acids, γ-aminobutyric acid and ethanolamine in the free fraction and 1/2 cystine and methonine in the total fraction, total and free amino acids of both cream and yellow anthers of the five cotton strains were quantitatively similar. Aspartic acid, asparagine, glutamic acid and glutamine were the predominant amino acids in both amino acid fractions of both anther colors. Arginine was present in more than trace amounts in the free fractions but it eluted from the column in peaks too broad to be quantitated accurately. Tryptophan analysis was not attempted. We feel that the small quantitative differences observed are probably not of biological significance.

Table 1. Total and free amino acid mean concentration in developing cotton anthers of cream and yellow counterparts of five cotton strains

Amino acid	Cream anthers Total	Yellow anthers Total	Cream anthers Free	Yellow anthers Free
	%			
Lysine	7.92	7.75	1.03	0.92
Histidine	2.43	2.37	0.64	0.62
Arginine	5.52	5.45	—	—
Aspartic acid	14.23	14.46	2.73	2.69
Asparagine	—	—	18.92	19.20
Threonine	4.43	4.44	1.17	1.23
Serine	5.51	5.50	3.37	3.39
Glutamic acid	13.03	12.92	1.60	1.87
Glutamine	—	—	9.40	10.73
Proline	6.52	6.34	8.60	8.35
Glycine	4.73	4.75	0.39	0.49
Alanine	5.28	5.32	1.81	2.06
1/2 Cystine	1.13	1.29	—	—
Valine	5.25	5.25	1.42	1.44
Methionine	1.51	1.53	—	—
Isoleucine	4.64	4.68	1.09	1.11
Leucine	7.74	7.72	1.64	1.75
Tyrosine	3.29	3.37	0.55	0.56
Phenylalanine	4.43	4.44	0.47	0.51
γ-Aminobutyric acid	—	—	4.47	4.38
Ethanolamine	—	—	0.92	1.09
Ammonia	2.41	2.41	9.15	5.51
Total amino N	3.62	3.62	0.68	0.72

The amino acid residue data are supported in part by previous analysis of total and free amino acids of cream cotton anthers [3]. In this study, we have identified for the first time two non-protein amino acids, γ-aminobutyric acid and ethanolamine, in the free fractions of cotton anther tissues. We also detected traces of methionine in the free fraction.

The mean concentrations of total nitrogen in cream and yellow cotton anthers were 4.79 and 4.73% of anther dry wt, respectively. Using the conversion of N to protein constant of 6.25, this represents 29.93 and 29.58 mg protein per g anther dry wt for cream and yellow anthers, respectively. These values are in the range of those reported for anthers of other plant species [4]. The total N contained in the free amino acid fraction was 18–20% of the total amino N. Thus the anthers are a rich source of free amino acids in cotton. The high amino N content of cotton anthers could explain why certain cotton insect larvae feed primarily on cotton anthers during their development [1, 3].

Since only slight quantitative differences in amino acid composition were noted between cream and yellow anthers, these nutrients are probably not responsible for the growth suppression of tobacco budworm larvae fed

developing yellow anthers. However, these data provide important information needed to develop a satisfactory laboratory diet resembling the insect's natural food for use in mass insect rearing and host plant resistance studies.

EXPERIMENTAL

Field plantings at Stoneville, Mississippi of genetic counterparts of cream and yellow anthers from the cotton strains DES-24, CAMD-SM, TM-1, Tamcot-37, and NM 868 were used as the source of anthers. One to three days before anthesis, flower buds of each strain were harvested, brought to the laboratory and immediately dissected. Anthers of each color of each strain were analysed separately. The anthers were frozen, lyophilized, weighed, and ground in a Wiley Mill to pass a 40 mesh screen. Duplicate N determinations were made with a Coleman Model 29 N analyzer. Subsamples of the anther powders were then taken and prepared for separate analyses of free and total amino acids using a Beckman Model 121 amino acid analyzer according to standard procedures for analysis of both physiological fluids and protein hydrolysates as previously described [5].

REFERENCES

1. Shaver, T. N., Garcia, J. A. and Dilday, R. H. (1977) *Environ. Entomol.* **6**, 82.
2. Hanny, B. W., Bailey, J. C. and Meredith, W. R., Jr. (1979) *Environ. Entomol.*, in press.
3. Burks, M. L. and Earle, N. W. (1965) *J. Agric. Food Chem.* **13**, 40.
4. Stanley, R. G. and Linskens, H. F. (1974) *Pollen, Biology, Biochemistry, Management*. Springer, New York.
5. Elmore, C. D. and King, E. E. (1978) *Plant Physiol.* **62**, 531.