Previous publications[1,3,4] have indicated that hydrogen bonding is the principal mechanism involved in binding to PVP. The adsorption of these amino acids appears to adhere to this concept.

Based on previous work[2], we would expect salts to elute earlier than tyrosine and tryptophan. Thus PVP may also be useful in the desalting of these two amino acids.

PVP chromatography may provide a convenient approach to the separation of phenylalanine, tyrosine and tryptophan from complex mixtures such as those containing polymeric plant pigments.

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A simple and rapid separation of pesticides by polyamide chromatography

The use of paper or thin-layer chromatography for the determination and identification of pesticides had been widely studied and reviewed by ZWEIG[1]. Recently, several workers have used the formamide impregnated paper[2], silica gel thin layer[3] and polyamide layer[4] for the separation of pesticides.

An extension of the work on polyamide layer chromatography[4] to analyses of organophosphorus compounds, chlorinated hydrocarbons and carbamates is presented in this note. The following results are obtained with a universal spraying reagent and different developing systems.

Experimental

Chemicals. Seven organophosphorus, five chlorinated hydrocarbons and two carbamate pesticides of FDA standard were used. The solvents and chemicals are first grade from Katayama Chemical Industries, Ltd., Osaka, Japan.

Thin-layer sheets. All polyamide layer sheets used were 15 × 15 cm produced by Cheng Chin Trading Co. Ltd., Taipei, Taiwan.

Chromatographic procedure. The standard techniques of ascending thin-layer chromatography[5] and the necessary pretreatments for pesticide residues[6] were employed.

Visualization. The following three reagents were sprayed in the indicated order. After each spraying, the chromatogram was dried and observed before the next spraying and was followed by U.V. exposure (15-W gemicidal lamps, at a distance of 10 cm) for 15 min: (1) 5% (v/v) bromine solution. Dissolve 5 ml of bromine water in 100 ml of carbon tetrachloride;(2) 0.25% (w/v) fluorescein sodium solution. Dissolve 250 mg fluorescein sodium in 5 ml of N,N-dimethylformamide before adding anhydrous ethanol up to 100 ml;(3) 1% (w/v) *o*-toluidine solution. Dissolve 1 g of *o*-toluidine in 100 ml of 95% ethanol.

Results and discussion

The R_F values of pesticides are shown in Table I. The minimum amount of the compounds detectable by the method are 0.1 μg organophosphorus compound, 2 μg chlorinated hydrocarbon, and 0.5 μg carbamate. It is also possible to differentiate the different groups of compounds from their different responses to the detection reagents. For example, organic chlorides failed to give colored spots when sprayed with bromine, fluorescein and *o*-toluidine, but they all gave visual spots after U.V. exposure. This method produced a chromatogram characterized by brown, yellow, dark green, gray, dark brown and red spots against a slightly reddish-brown background.

TABLE 1

CHROMATOGRAPHIC DATA OF PURE COMPOUNDS

Pesticides	R_F *value*[a]		*Color of spot in each stage*[b]			
			Spraying reagent			*U.V. exposure*
	(*I*)	(*II*)	*Bromine*	*Fluorescein*	*o-Toluidine*	
DDVP	0.81	0.92	—[c]	—	—	B
Malathion	0.78	0.85	B	Y	D	DG
Diszinon	0.78	0.67	B	Y	D	DG
Ethylparathion	0.65	0.46	B	Y	D	DG
Methylparathion	0.64	0.48	B	Y	D	DG
Sumithion	0.64	0.56	B	Y	D	DG
Ethion	0.58	0.32	B	Y	D	DG
Lindane	0.45	0.26	—	—	—	DB
Endrin	0.40	0.21	—	—	—	B
Aldrin	0.36	0.20	—	—	—	B
DDT	0.31	0.07	—	—	—	B
Kelthane	0.21	0.31	—	—	—	B
Sevin	0.68	0.55	B	Y	D	Gr
Zineb	0.00	0.78	B	Y	D	DG

[a] (I), Acetone–ethanol–water (2:2:4). (II), Ethanol–ammonia–water (5:2:4).
[b] Y, yellow, B, brown, DG, dark green, DB, dark brown, R, red, D, dark, Gr, gray.
[c] —, Negative reaction to detection reagent.

TABLE II

THE METHOD APPLIED FOR THE ANALYSIS OF PESTICIDE RESIDUE

No.	*Vegetables*	*This method results*		*SMAHC method results*
		R_F value (system I)	*Responsible pesticide*	
1–8		—	—	—
9	Celery	0.44	Lindane	Lindane
10–15		—	—	—
16	Leak	0.44	Lindane	Lindane
17–30		—	—	—
31	Egg-plant	0.62	Sumithion	Sumithion
32–45		—	—	—
46	Parsley	0.75	Malathion	Malathion
47–59		—	—	—
60	Spinach	0.45	Lindane	Lindane

TABLE III

APPLICATION FOR PREPARATION

No.	*Components shown on the label*	*R_F value (system I)*	*Color of spots*	*Results*
I	DDVP	0.79	B	DDVP
II	Lindane	0.44	B	Lindane
III	Lindane	0.45	B	Lindane
	DDVP	0.78	B	DDVP
	Sumithion	0.63	DG	Sumithion

The method was suitable for the detection of pesticide residues as well as for pesticide preparation. About sixty samples of twenty-five kinds of vegetables obtained from the market were examined by this method. The results were compared with those obtained by the Standard Methods of Analysis for Hygienic Chemists[6] (Table II).

Three samples of known pesticide preparations were also checked. The results are shown in Table III.

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