present authors. Unfortunately, in the limited time between changes in military assignments, only the brief observations below could be made.

Tests were carried out in an insectary with an average temperature of 75° F. The mosquitoes were placed in cages with two layers of screening ½″ apart, with the front opening covered by heavy muslin cloth. Sugar water was kept in the cages, and every third day a chick was introduced into each cage to provide a blood meal. Eggs were placed in containers in screened cages for hatching and the rearing of larvae. Each pupa was removed and put into a separate test tube, and each adult transferred to a separate dry tube as it emerged. The

TABLE 1

CROSSING ATTEMPTS WITH *A. albopictus* AND *A. aegypti* MOSQUITOES

Caged	Progeny	Observations
Trial A, female A. albopictus and male A. aegypti		
Group 1		
13 ♀ × 7 ♂	None	A few eggs, none hatched
Group 2		
59 ♀ × 37 ♂	None	Some eggs, none hatched
Group 3		
170 ♀ × 112 ♂	None	A few eggs, none hatched
Group 4		
59 ♀ × 123 ♂	None	No eggs
Trial B, female A. aegypti and male A. albopictus		
Group 1		
8 ♀ × 10 ♂	54 ♀ and 104 ♂	
F_2 generation		
44 F_1 ♀ × 83 F_1 ♂	11 ♀ and 31 ♂	
Group 2		
52 ♀ × 28 ♂	None	Numerous eggs, none hatched
Group 3		
105 ♀ × 42 ♂	2 ♂	Experiment interrupted
Group 4		
61 ♀ × 162 ♂	14 ♀ and 45 ♂	

males and females to be introduced into cages were routinely checked under a low-power microscope by two observers.

A binocular dissecting microscope was used to check distinguishing markings of the offspring of the crosses. The pattern on the mesonotum, the sides of the thorax, the legs, the abdomen, the head, and the palpi was carefully examined. *A. aegypti* has a characteristic lyre pattern and *A. albopictus* a broad central band on the mesonotum. These are the principal distinguishing marks. The patterns of silver scales on the occiput and on the sternopleura and mesepimeron are also different. Comb-scale characters of the larvae were checked. Male terminalia were dissected out and examined. Particular attention was paid to the morphology of the ninth tergite, which is markedly different in the two species.

Experiments were started on August 5, 1944, and terminated on October 17, 1944.

The experiments are summarized in Table 1. The *albopictus* females of trial A did not feed readily on blood, while the *A. aegypti* females in trial B took blood readily. Sperm was found in the spermatheca of only one of 24 albopictus females (trial A, group 3) dissected, although copulation had been observed. In group 2 of trial B, copulation was observed and of three aegypti females examined on October 17, one had sperm in the spermatheca, although no eggs were hatched. All of several aegypti females from group 4 of trial B, examined on October 12, had sperm in their spermathecae.

All of the offspring, including the F_2 generation of group 1, trial B, resembled *A. aegypti* in every detail. The first adult F_2 were observed on October 17, but the experiment had to be terminated at that time.

It is noteworthy that in the experiments of Toumanoff and of Hoang-Tich-Try, as well as in our own tests, offspring of the crosses have resembled the female parent. In our work reported above, this resemblance held true down to the finest morphological details of larvae and adult mosquitoes which it was possible for us to check.

It is difficult to explain these results on a genetic basis. One possibility is that fertilization by the male of the other species was not a true fertilization, but served to stimulate parthenogenetic development of the ovum. Be this as it may, both male and female offspring were obtained.

It is interesting that Summers Connal (*3*) working on variations observed in *A. aegypti* in Lagos, Nigeria, has noted an extensive range of color variations (the lyre pattern remaining constant). The possibility that *A. aegypti* will cross with closely related species in nature is suggested.

References

1. EDWARDS, F. W. *Mosquitoes of the Ethiopian region.* (Pt. 3.) (Natural History), British Museum, London: 1941. P. 130.
2. HOANG-TICH-TRY. *Bull. Soc. path. exot.*, 1939, **32**, 511.
3. SUMMERS CONNAL, S. L. M. *Bull. entomolog. Res.*, 1927–28, **18**, 5.
4. TOUMANOFF, C. *Bull. Soc. méd. chir. de l'Indochine*, **1937**, **51**, 964.
5. TOUMANOFF, C. *Bull. Soc. path. exot.*, 1939, **32**, 505.

Effectiveness of Vitamin P Compounds in Counteracting Anticoagulant Action of Dicoumarol

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Campbell (*4*) and Overman, *et al.* (*8*) demonstrated in the rabbit that 2-methyl-1, 4-naphthoquinone counteracted the action of dicoumarol. Overman, *et al.* (*8*) also reported the ability of ascorbic acid to reduce the hypoprothrombinemic response to dicoumarol. Later, this Wisconsin group (*1*) found that dicoumarol increases the excretion of ascorbic acid in the rat.

Since vitamin P compounds have been recommended as adjuncts in the clinical use of dicoumarol (*5*), it seemed important to determine any possible interaction between the two. Rats (250–300 gm in weight) were used in accordance with the technique of Overman, *et al.* (*7*). The chemicals under test mixed in cottonseed oil were administered orally on three successive days with the prothrombin time being determined 4 hours after the last dose. Five rats were in each series; dosages were as follows: dicoumarol, 40 mg/kg; vitamin P compound, 80 mg/kg; ascorbic acid, 80 mg/kg; Menadione, 3.2 mg/kg. Results are recorded as average values for each series. Prothrombin times were determined by the method of Campbell, *et al.* (*3*). From these findings, it is apparent that D-catechin and rutin counteract dicoumarol while hesperidin does not. Ascorbic acid counteracts dicoumarol and acts synergistically with D-catechin in this respect.

Thus, the synergism of ascorbic acid and the vitamin P compounds is found in at least three systems: (1) antihyaluronidase action (*2*); (2) antioxidant action for autoxidation of adrenaline (*9*); (3) counteraction of hypoprothrombenemia produced by dicoumarol.

The significance of the physiological antagonism of dicoumarol and vitamin P compounds is unknown; however, a similar antagonism in bacteriological systems has been reported (*6*). It seems logical that the mechanism controlling hemorrhage in all its phases would be interrelated. One of these mechanisms would be reflected in prothrombin times.

TABLE 1

PROTHROMBIN TIMES IN RATS UNDER DICOUMAROL TREATMENTS*

	D	D M	D H	D H M	D R	D R M	C D	D C M	D C	D C AA
1.	9′	6′44″	9′33″	12′38″						
2.	15′15″	7′1″	14′51″	10′24″						
3.	10′46″	5′22″	4′35″	13′2″						
4.	11′51″	8′22″			5′38″	8′16″				
5.	14′3″	5′42″			7′33″	3′21″				
6.	12′33″	6′40″			9′21″	7′31″				
7.	11′16″	6′16″					5′21″	4′41″		
8.	5′4″						4′2″		2′26″	47″

* Abbreviations used are: D—dicoumarol; M—menadione; H—hesperidin; R—rutin; C—catechin; AA—ascorbic acid.

References

1. BAUMANN, C. A., FIELD, J. B., OVERMAN, R. S., and LINK, K. P. *J. biol. Chem.*, 1942, **146**, 7.
2. BEILER, J. M., and MARTIN, G. J. *J. biol. Chem.*, 1947, **171**, 507.
3. CAMPBELL, H. A., SMITH, W. K., ROBERTS, W. L., and LINK, K. J. *J. biol. Chem.*, 1941, **138**, 1.
4. LINK, K. P. *Proc. Inst. Med. Chicago*, 1945, **15**, No. 16.
5. MACLEAN, A. L., and BRAMBEL, C. E. *Trans. Amer. ophthal. Soc.* (82nd Annual Meeting, San Francisco), 1946.
6. NAGHSKI, J., COPLEY, M. J., and COUCH, J. E. *Science*, 1947, **105**, 125.
7. OVERMAN R. S., FIELD, J. B., BAUMANN, C. A., and LINK, K. P. *J. Nutrition*, 1942, **23**, 589.
8. OVERMAN, R. S., STAHMANN, M. A., and LINK, K. P. *J. biol. Chem.*, 1942, **145**, 155.
9. RAYLE, A. L., and PAPAGEORGE, E. *Proc. Amer. chem. Soc.* (113th Meetings, Chicago), 1948. P. 20C.

Effect of *p*-Chlorophenoxyacetic Acid on the Vitamin C Content of Snap Beans Following Harvest

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Attention is being directed toward the effect of plant growth regulating substances on chemical changes that occur in fruits, leaves, and storage organs of plants after they are harvested. Some results of this research have been reported (*2, 4, 6*).

The vitamin C content of snap bean fruits (pods) increases as they develop, reaches a maximum as they attain full size, then decreases, regardless of whether the pods are harvested at this stage of development or left on the plant to mature (*1, 5*).

In extending research in this field, experiments were made to determine the effect of *p*-chlorophenoxyacetic acid on the vitamin C content of bean fruits of marketable size. Bean plants (Black Valentine, Asgrow strain) were grown in a greenhouse. When the largest fruits first attained a size acceptable for commercial use, water mixtures containing various amounts of *p*-chlorophenoxyacetic acid and 1% of Tween 20[1] were sprayed on the attached fruits. Concentrations of the acid used were: 0, 50, 250, 500, and 1,000 ppm.

Samples for vitamin analysis consisted of 6 to 10 replicates of 50 gm each, and values reported are the averages of these replicates. All results are reported on the basis of fresh weight at the time of analysis. The

[1] A sorbitol derivative used as a solubilizer and supplied by the Atlas Powder Company of Wilmington, Delaware.