Discussion. The mechanoreceptive function of the trichoid sensilla on the male tobacco hornworm moth is suggested by: 1. innervation by at least one bipolar neuron, 2. dendritic distal processes (terminal filament) attached to the hair inner wall, 3. nerve response to transverse displacement of tactile hairs and 4. a latency of 0.2 msec which is similar to latency figures found in earlier mechanoreceptive studies[11–13].

A certain degree of hair displacement is apparently required to obtain a measurable response. Micro-displacement of the hairs by sonic energy at various frequencies in the Hertz and kilo-Hertz range (intensity level of 80 decibles), failed to elicit a response when recording from the antennal nerves or cervical connectives.

The continuing adaptation shown in response to the distal and proximal movements of the stimulating fork does not show a corresponding spike rhythm when the direction of stimulation is reversed (i.e. proximal movement). This might be explained by the hairs not returning to their initial resting position in time for a displacement from the reverse direction. Such unelicited movements might disrupt any similarity in spike rhythm to the initial direction of displacement.

Based on the theory proposed for function of hair cells in the lateral line canal organ, directional sensitivity is apparently lacking for the trichoid sensilla in *Manduca*[14]. Theoretically, a displacement of stereocilia in one direction caused a depolarization, followed by a hyperpolarization when the cilia were stimulated in the reverse direction. The data from this study indicate only a depolarizing response regardless of stimulus direction which continually adapts after a period of 100 msec. This lack of directional sensitivity thus may be explained by the radial symmetry which exists in the cuticular hair joint[15].

The nerve impulses in this study were recorded extracellularly from the antennal nerve as positive going responses. A similar observation was noted while recording from the leg nerve of the blowfly. Another mechanoreceptor study also showed positive going spikes superimposed on a negative going receptor potential, while recording from the cut chemosensory hair on the labellum of *Phormia*[16]. This phenomenon was explained by the pressure from the fluid filled electrode against the membrane which separates the distal process of the receptor from the lumen of the hair. Such a recording situation is apparently responsible for the positive going spikes. Since the method of recording was different in this study, the above explanation does not seem appropriate. Intracellular recordings will have to be accomplished in *Mandua* to determine if the criteria for positive spikes are met[17].

From the obvious mechanoreceptive qualities of these antennal hairs, it is conceivable that these sensilla may serve as air speed indicators. The possibility of a reflex initiated at these antennal hairs (by air speed velocities) with subsequent efferent activities in a descending pathway should be investigated[18].

Résumé. Des études structurales fonctionelles suggèrent une fonction méchanoréceptive pour le S. trichoidea sur l'antenne de la phalène *Manduca sexta*. Les soies de ses antennes sont innervées par un seul neurone bipolaire, dans lequel la dentrite est couronnée par une cellule scolopale. Les pointes positives dont l'amplitude varient ont été enregistrées sur le nerf antennal avec déplacement transversal des soies antennales.

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Effects of CMH on Growth and Alkaloid Formation of *Datura metel* L.

More recently, some hydrazonium salts are the novel group of the growth regulators, such as N,N-Dimethyl(2-chloroethyl)-hydrazonium chloride (CMH), N,N-Dimethyl-(2-bromoethyl)-hydrazonium bromide (BMH), N, N-Dimethyl-isopropyl-hydrazonium bromide (IMH), and N,N-Dimethyl-allyl-hydrazonium chloride (AMH). These derivatives of hydrazonium could cause a reduction in a number of plants in longitudinal growth[1,2]. On the other hand, using CMH under various conditions resulted in a stimulatory effect on stem length and dry matter product of wheat plants while the invertase and amylase activity showed the same tendency[3,4]. Moreover, minerals and pigment contents of wheat plants increased by using the CMH[5]. Whereas treating soyabean plants with CMH and CCC in doses of 50–400 ppm at two different growth stages did not affect the content of N-fractions and oil content in the seeds of treated plants; yet some treatments led to slight increases in total carbohydrates[6]. No information is recorded on the influence of CMH upon medicinal plants. The investigation presented here was made to discover how far the growth and tropane alkaloids synthesis in *Datura metel* L. have been influenced by CMH.

Uniform size seedlings of *Datura metel* L. (45 days old) were transplanted on 10th May 1971 individually into 7.5-inch pots using Nile-Silt of loamy soil, supplimented with 5 g ammonium sulphate, 2.5 g superphosphate and 1.5 g potassium sulphate. The different concentrations of CMH used (0, 1000, 2000 and 4000 ppm in water solution) were sprayed by a small pressure pump at a rate of 10 ml per plant. CMH used was 46% solution obtained from BASF, Limburger Hof, W. Germany, to whom the author is very indebted. The plants received two sprays at 3 and 5 weeks intervals after transplanting. 21 pots were used with 3 replicates for each concentration of CMH as well as con-

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Table I. Effect of CMH on vegetative growth of plants

Treatments (ppm)	No. of leaves	Stem length (cm)	Leaves (g)		Stems (g)		Roots (g)	
			Fresh	Dry	Fresh	Dry	Fresh	Dry
0	10.54	16.37	9.42	1.54	5.23	0.69	4.81	0.76
1000	11.30	17.42	10.08	1.60	5.58	0.69	6.62	0.96
2000	14.00	25.61	14.64	2.21	9.92	1.22	7.04	1.25
4000	13.50	24.56	13.93	2.04	9.18	1.07	6.71	1.07
L.S.D.$_{.05}$	3.0	3.9	3.1	0.4	2.9	0.2	2.1	0.22

Table II. Effect of CMH on pigments (mg/g fresh leaves) and alkaloidal contents (mg/g dry material) in plant organs

Treatments (ppm)	Chlorophyll a	Chlorophyll b	Carotenoids	Leaf		Stem		Root	
				Hyoscine	Hyoscyamine	Hyoscine	Hyosciamine	Hyoscine	Hyosciamine
0	1.25	0.51	0.54	1.6	0.7	1.3	1.0	1.1	0.8
1000	1.43	0.56	0.56	2.0	1.1	1.9	1.4	1.0	0.7
2000	1.47	0.57	0.62	3.2	1.8	2.2	1.7	0.9	0.6
4000	1.54	0.59	0.65	3.4	1.8	2.7	1.8	0.6	0.4
L.S.D.$_{.05}$	0.31	–	0.07	1.2	0.5	0.8	0.6	0.3	0.2

trol at the onset of the experiment, inside the greenhouse of Experimental Station, Dep. Bot., N.R.C., Cairo, Dokki, Egypt.

Measurements of growth characters were recorded on 30 July 1971. The values of dry matter product were calculated after drying all organs of plants in an oven at 105 °C. Samples from plant organs were dried directly in a circulating hot-air oven at 55 °C and then powdered (No. 60 mesh) for alkaloid determination according to French[7], Brummet-Sciuchetti[8]. Concentrations of chlorophyll a and b were calculated according to MacKinney's specific absorption coefficients[9], and Von Wettstein's equation was used to calculate caroteinoid content[10].

It can be seen from data in Table I, CMH-treatment exhibited a stimulatory effect upon the number of leaves, stem length, fresh or dry production of leaves, stems, and roots. The differences between CMH-treatments at the rate of 2000 or 4000 ppm and untreated plants were statistically significant. However, there was statistically significant effect on the stem length and fresh or dry production of all organs, between the higher and lower doses of CMH. The dose of 2000 ppm of CMH-treatment resulted in the largest of all growth characters, which was highly significant compared with control plants and 1000 ppm of CMH-treatment. El-Fouly et al.[3] noted that low doses of CMH produced higher wheat plants than control ones, while at high concentrations these differences were diminished. The observations on dry matter production showed the same tendency.

It appears from Table II that CMH-treatment at the rate of 2000 and 4000 ppm solution were significantly effective for chlorophyll a and total carotenoids. Whereas the lower dose of 1000 ppm exhibitedan adverse effect. Jung et al.[5] reported that in the vegetative stage of wheat plants the contents of chlorophyll a, chlorophyll b, carotene, lutein, neoxanthin and violaxanthin increased with higher doses of CMH.

Table II shows that CMH-treatments effectively stimulated the hyoscine and hyoscyamine contents in both leaves and stems. On the other hand, the alkaloids content in roots declined. However, the alkaloid content in the former organs of datura plants at 2000 ppm or 4000 ppm CMH showed significantly higher values, while the latter organ had the opposite tendency in comparison to controls. There was a significant effect between the higher and lower doses of CMH.

It is evident that tropane alkaloids of datura plants are synthesized in the root system, then transferred to the aerial parts.

It may be concluded that CMH-treatment activates the alkaloid formation in the roots; however, the higher doses of CMH accelerate the migration of most of the active principal matters from the roots into the aerial partions to accumulate in the leaves and stems, respectively.

Generally, this study gave convincing evidence for applying CMH in 2000–4000 ppm doses to *Datura metel* L., showing a favourable vegetative growth as well as an increase in pigments and in alkaloidal contents of the leaves and stems. On the contrary, the roots showed less alkaloids in the higher than the lower doses of CMH.

Zusammenfassung. Hydrazoniumsalze bewirken eine Zunahme der Alkaloide Hyoscin und Hyoscyamin in Stengeln und Blättern, nicht aber in Wurzeln von *Datura metel*.

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