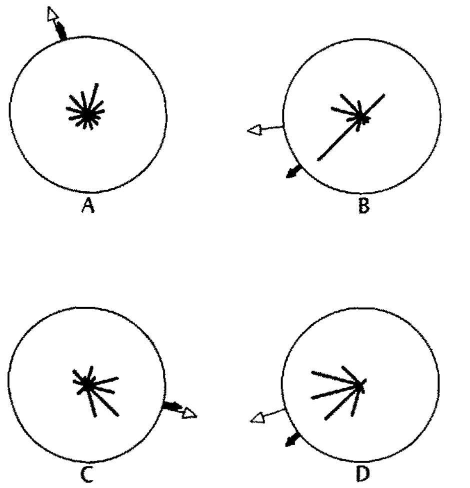

Fig. 3. Orientation at night when the moon is absent. (A) Sky visible, partially covered with clouds. Animals transferred behind the dunes. $n = 486$, $P < 0.0001$. (B) Sky visible, no clouds. Animals transferred to the top of a hill. $n = 29$, $P < 0.05$. (C) The same experiment with animals from another shore. $n = 56$, $P < 0.01$. (D) Sky screened. $n = 27$, $P < 0.01$.

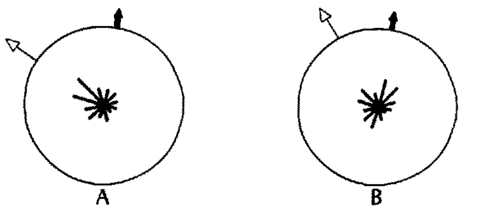

Fig. 4. Orientation and the earth's magnetic field. See text. (A) $n = 410$, $P < 0.0001$. (B) $n = 414$, $P < 0.0001$.

Stimulated by the experiments of SCHNEIDER[11], BECKER[12] and others on the influence of magnetism on orientation, we have compensated the earth's magnetic field down to 50 $\gamma$ (normal horizontal strength being 0.18 gauss) by means of Helmholtz coils. This was done in the Palaeomagnetic Institute at Utrecht some metres below the earth's surface. The animals used in these experiments were stored in the laboratory for several days, using a tilted aquarium with a layer of sand and some sea water. The results show that the animals have a tendency to orientate in total darkness when the natural magnetic influence is present (Figure 4A). This tendency remains when the earth's magnetic field is almost eliminated (Figure 4B). The orientation being only weak, the large number of observations brings about a high level of significance. Further studies on this subject will be undertaken in the near future.

*Zusammenfassung*. Die Versuche von PAPI und PARDI[1–6] wurden mit *Talitrus saltator* wiederholt. Auch unter völligem Lichtabschluss zeigten die Tiere ein noch ähnlich orientiertes Verhalten. Ausschaltung des erdmagnetischen Feldes bis auf 50 $\gamma$ konnte die Orientierung im Dunkeln nicht aufheben.

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[11] F. SCHNEIDER, Ergebn. Biol. *26*, 147 (1963).
[12] G. BECKER, Naturwissenschaften *50*, 664 (1963).

## Response of *Pisum sativum* Linn. to Gibberellic Acid

Earlier workers[1–3] have reported that spraying various crop plants with gibberellic acid (GA) at their various growth stages invariably resulted in the increased vegetative growth of aerial parts but did not increase the total yield. Some of them[2,3] have reported that treatment with GA in fact depressed the yields. A trial conducted at a sewage farm on *Pisum sativum* has produced interesting results. Spraying with increasing concentrations of GA on 4-week-old (pre-flowering) and 8-week-old (flowering stage) plants resulted in increasing and decreasing total green pod yields, respectively.

*P. sativum*, variety Bonneville, was grown during the winter season on a sewage farm. Randomized block design with all possible combinations of the 2 ages (4 and 8 weeks old) and 5 GA concentrations (0, 75, 150, 225 and 300 ppm) with 4 replications was used. 10 plants at 45 · 23 cm spacing formed a plot. The crop was maintained on sewage water depending on the condition of soil and crop plants. The analysis of sewage water contained 22.13 ppm nitrogen ($NO_3$), 0.075 ppm phosphorus ($P_2O_5$), and 26.2 ppm potassium ($K_2O$). Apart from various growth characteristics (data to be published), the green marketable pods were picked every 3 days starting from the 11th week after sowing, and the separate yields and the mean total yield were obtained (Table).

There were no significant differences between the mean green pod yields due to different GA concentrations, whereas significantly different yields were obtained when GA was sprayed at the 2 different growth stages. A significant differential response to concentrations when sprayed at the 2 growth stages was observed. The interesting point is that when plants were sprayed at the pre-flowering stage, corresponding increase in the yield was recorded with higher concentrations of GA.

The results of spraying GA at the flowering stage are in conformity with the findings of earlier workers[1–3]

[1] E. F. ALDER, C. LEBEN, and A. CHICHUK, J. Am. Soc. Agron. *51*, 307 (1959).
[2] D. G. MORGAN and G. C. MEES, Nature, Lond. *178*, 50, 1356 (1956).
[3] D. G. MORGAN and G. C. MEES, J. agric. Sci., Camb. *50*, 49 (1958).

Mean green pod weight (kg) per 10 plants as affected by different treatment combinations

| Age of plants at spraying (weeks) | GA concentration (ppm) 0 | 75 | 150 | 225 | 300 | Mean | SEm | F ratio | C.D. at 5% |
|---|---|---|---|---|---|---|---|---|---|
| 4 | 1.395 | 1.477 | 1.635 | 1.730 | 1.874 | 1.622 | ± 40.7 | Significant | 0.118 |
| 8 | 1.396 | 1.265 | 1.270 | 1.201 | 1.143 | 1.255 | | | |
| Mean | 1.395 | 1.372 | 1.452 | 1.465 | 1.508 | | | | |
| SEm | | | ± 57.6 | | | | | | |
| F ratio | | | Not significant | | | | | | |

(value of regression coefficient = − 0.7601); whereas the reverse was true when the crop was sprayed at the pre-flowering stage (value of regression coefficient = + 1.6143). A unit increase in GA concentration spray at the pre-flowering stage resulted in about 2.7 kg of extra total mean yield per 10 plants as compared to those sprayed at the flowering stage. Further work is, however, needed to determine the cause of this increase in yield[4].

*Zusammenfassung.* Die Applikation von Gibberellinsäure bei *Pisum sativum* bewirkt im vegetativen Entwicklungsstadium eine Ertragssteigerung, im Blühstadium eine Ertragsverminderung.

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[4] The authors are grateful to Dr. P. C. RAHEJA, Dr. D. K. MISRA and Mr. M. B. JAIN for their help.

## Hormone Dependency of Sex-Linked Feathering of Female Hybrid Chick Embryos (Cross New Hampshire ♂ × Light Sussex ♀)

The $F_1$-generation of this cross shows a sex-linked difference in down colour: on hatching the males are white and the females reddish-brown. The pigmentation of the females becomes visible on the 11th day of incubation when a yellow stripe appears on the back and neck. By the 14th day of incubation, the brown colour has spread over wings, thighs and occiput (Figure 1).

In a previous communication (GROENENDIJK-HUIJBERS[1]) evidence was presented in favour of the concept that the red pigment of the female down cannot be formed when no ovarian hormone is circulating: after hemi- and subtotal castration on the 4th day of incubation, the down colour of the 14-day-old female embryos ranged from a pale brown to almost white. The shortage of ovarian hormone was also manifested by the partial or full preservation of the right Müllerian duct (Md). A detailed report on this matter is in preparation. The results obtained in castration experiments agree with the observation of HAMILTON[2] that melanophores of skin ectoderm from 6- to 7-day-old embryos of the Rhode Island Red and New Hampshire breeds, cultivated in vitro, did not produce red pigment unless gonadal hormones (either oestrogens or androgens) were added to the culture medium. The latter studies suggest substituting the ovarian hormone of the subtotally castrated female embryos with

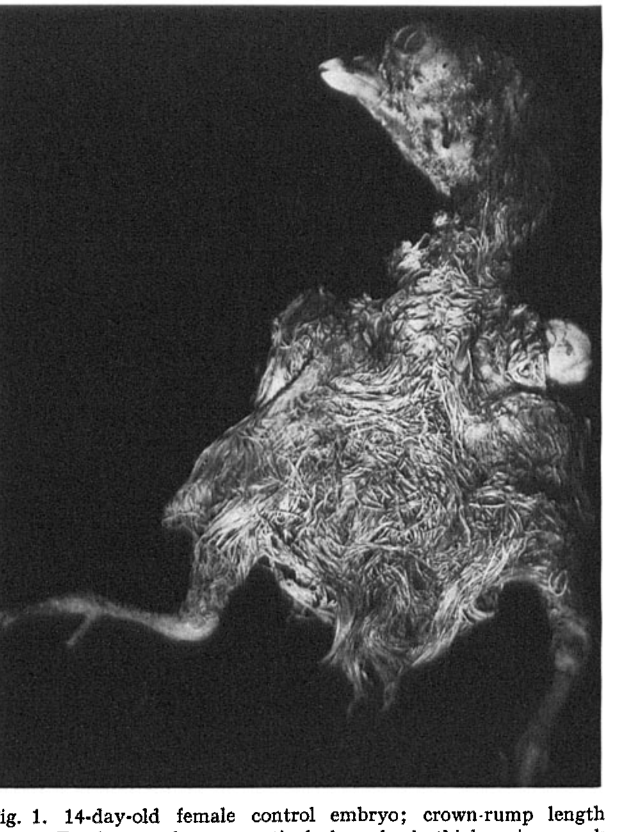

Fig. 1. 14-day-old female control embryo; crown-rump length 5.7 cm. Feathers are brown, particularly on back, thighs, wings, neck and occiput.

[1] MARGOT M. GROENENDIJK-HUIJBERS, Experientia *22*, 302 (1966).
[2] H. L. HAMILTON, Anat. Rec. *78*, 525 (1940).