ENHANCEMENT OF PEAR (*PYRUS PASHIA* L.) SEED GERMINATION BY GA_3 AND ETHANOL

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PEAR (*Pyrus pashia* L.) seeds are difficult to germinate unless they are stratified as the most common cause of seed dormancy in woody plants native to temperate region is a requirement for chilling of hydrated seeds. Elimination of stratification to break the dormancy and achieve reliable and rapid germination of pear seeds is essential for a successful breeding programme.

Several organic compounds are known to overcome seed dormancy[1] and ethanol has been found very effective in breaking seed dormancy[2]. Exogenous GA has also been reported to be effective in causing non-stratified dormant hazel nut (*Corylus avellana* L.) seeds to germinate[3]. In the present investigation, therefore, the effect of ethanol and GA_3 in breaking dormancy and promoting germination of pear seeds was studied. The effect of ethanol and GA_3 on seedling growth was also studied.

Seeds were collected from ripened wild pear (*Pyrus pashia* L.) fruits and stored dry in paper envelopes in room conditions.

Prior to germination studies, seeds were surface-sterilized for 5 min in 0.1% mercuric chloride solution. Germination tests were conducted in sterilized 9 cm diameter glass petri dishes and lined with Whatman No. 2 filter paper. Seeds (20–25) were placed in each dish together with distilled water (control) or treatment solutions (ethanol: 0.5, 1, 2 and 5%; GA_3: -3 log M, -5 log M and -7 log M) and incubated at 24 ± 1°C in darkness. Radicle protrusion was the criterion used for germination and the cumulative percentages of seed germination were finally determined for each treatment.

To determine the chilling requirement, 50 seeds each were placed in sterilized glass petri dishes lined with moistened cotton and stratified at 4 ± 1°C in darkness.

Germinated seeds in each treatment were transferred to glass petri dishes lined with Whatman No. 2 filter paper moistened with distilled water and incubated at 24 ± 1°C and the seedling growth (shoot and root length) was measured after seven days. The data were subjected to statistical analysis.

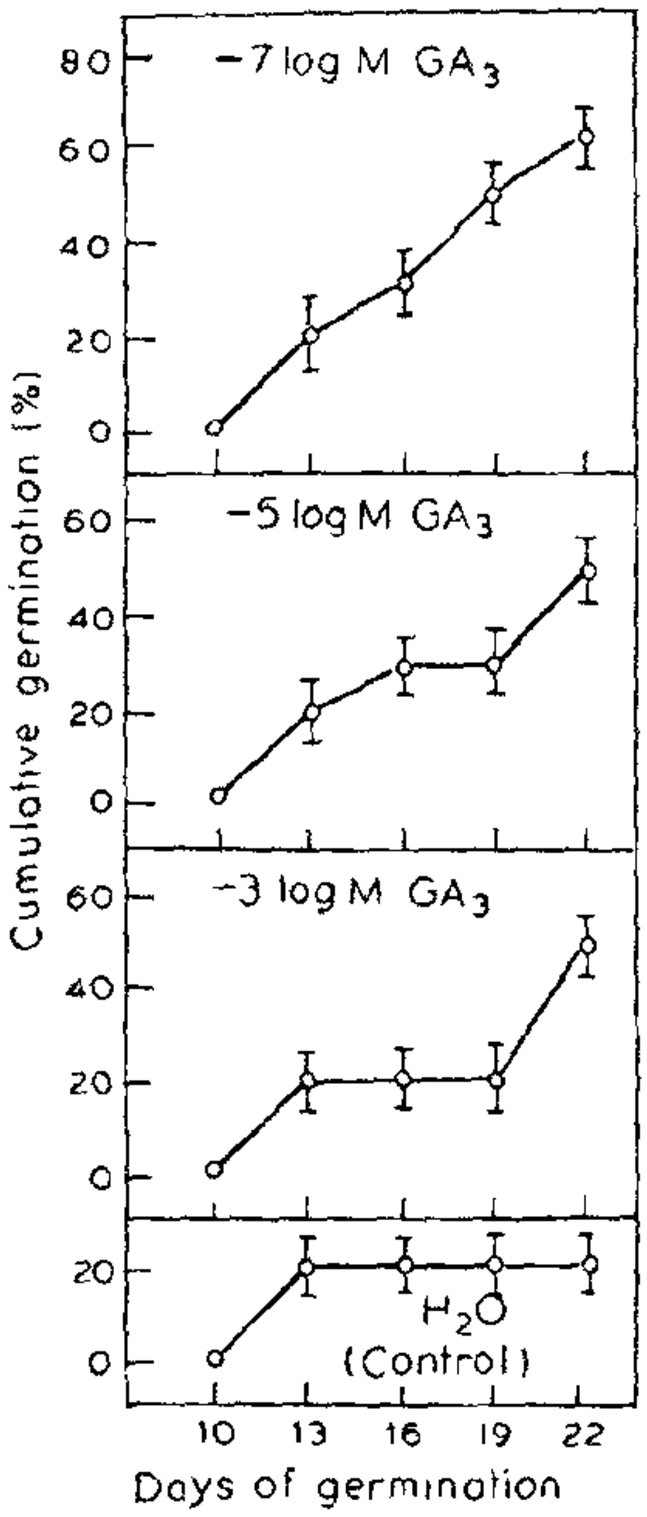

Figure 1. Interaction of dose and time period of application in the dormancy breaking effect of GA_3 in pear seeds. Dark incubation was at 24 ± 1°C. Mean ± SE of 4 replications, each of 20 seeds.

The interaction of concentration and the length of treatment on the induction of germination by GA_3 are shown in figure 1. Dark germination was maximum (60%) when unstratified seeds were incubated with -7 log M GA_3 for 22 days while only 20% germination could be achieved in the corresponding control. The effects of -3 and -5 log M GA_3 were comparable though higher than control. The response was detectable after only 13 days of incubation in the treatment solutions and control.

Continuous administration of 0.5–5% ethanol induced germination in unstratified seeds (figure 2). Significantly, the response was quick and detectable only after four days of incubation in 2% ethanol. Though per cent germination was maximum (90%) after 22 days of incubation in 5% ethanol, the response was delayed and detected only on the 13th day of incubation. The responses of 0.5 and 1% ethanol were comparable.

Studies on seedling growth of seven-day-old pear seedlings germinated under different conditions (table 1) revealed that the average shoot and root length was more pronounced in seedlings germinated in 2% ethanol followed by stratified seeds.

Chilling requirement for pear seeds stratified at $4 \pm 1°C$ in darkness under hydrated conditions was 22–30 days for breaking of dormancy.

Ethanol was effective in breaking dormancy in pear seeds and the effect was more pronounced than that of GA_3. The germination responses with ethanol were rapid inducing high values only after seven days of incubation (2% ethanol, figure 2), much earlier than GA_3. Ethanol was effective in breaking dormancy over a fairly wide range of concentrations (0.5–5%). However, delayed germination (figure 2) and poor seedling growth (table 1) were manifested at high concentration (5% ethanol). These findings related to the effect of ethanol are similar to those obtained earlier in other crops[2-4].

The chilling requirement at $4 \pm 1°C$ was worked out as 22–30 days in comparison to 0–15 days reported[5] at 10°C.

The measured response to ethanol at all concentrations reflects a balance between promotive and toxic effects on germination. The promotive effects of ethanol on germination may well be attributed to its anaesthetic effect[1-4]. Since ethanol can be

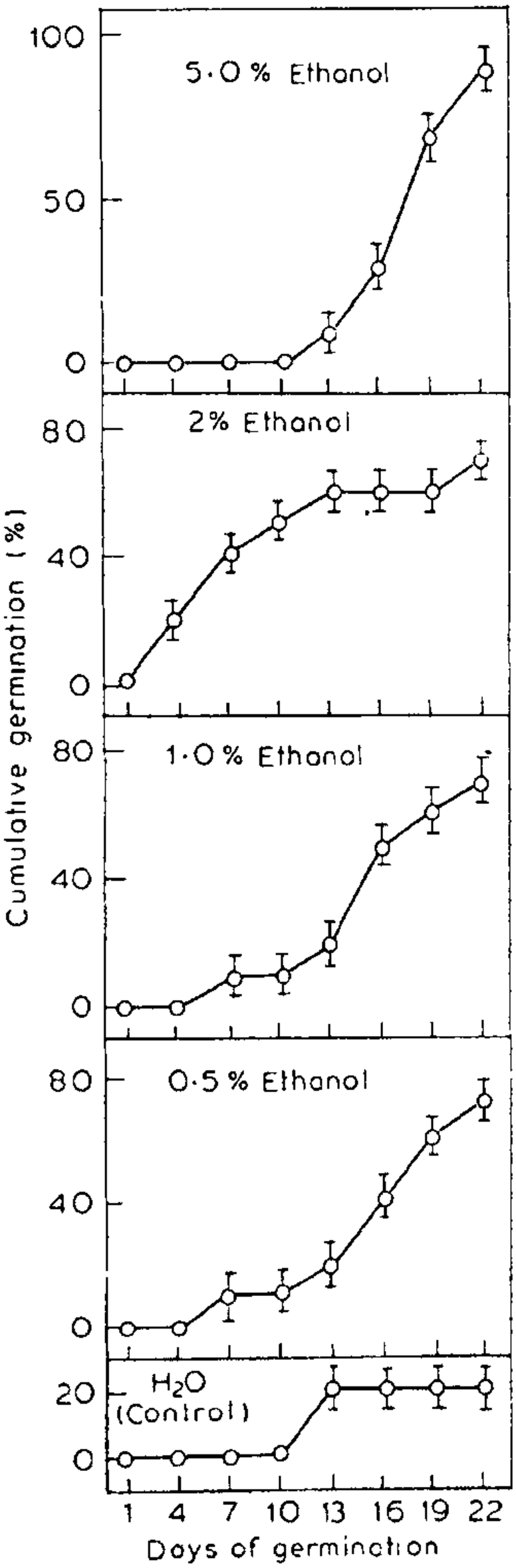

Figure 2. Interaction of dose and time period of application in the dormancy breaking effect of ethanol in pear seeds. Dark incubation was at $24 \pm 1°C$. Mean ± SE of 4 replications, each of 20 seeds.

Table 1 *Changes in the length of shoot and root of seven-day-old pear seedlings germinated under different treatments. Dark incubation was at 24 ± 1°C*

Treatments	Average shoot length (cm)	Average root length (cm)
Control	2.70 (18)	2.85 (18)
− 3 log M GA_3	2.38 (27)	1.93 (27)
− 5 log M GA_3	1.55 (27)	1.30 (27)
− 7 log M GA_3	2.52 (32)	1.97 (32)
0.5% Ethanol	2.65 (28)	1.35 (28)
1% Ethanol	2.53 (27)	1.98 (27)
2% Ethanol	2.75 (32)	2.98 (32)
5% Ethanol	1.49 (36)	1.02 (36)
Stratified (22–30 days)	2.70 (32)	3.95 (32)

Each figure of length is an average of figures indicated in bracket; LSD (at 5% level of significance) = 0.95.

oxidized by a series of reactions linked to glycolysis and Krebs cycle[6] and the rate of activity of Krebs cycle and/or glycolysis is important for controlling the dormancy[7-10], there is another possibility of ethanol acting as a respiratory substrate and exhibiting faster kinetics of germination. Though the role of ethanol as a respiratory substrate is uncertain, it is known to occur naturally and metabolize in plant system[6].

The possible involvement of ethanol as an anaesthetic to promote germination and/or as a respiratory substrate with dormancy breaking effect through respiration is further being probed into in our laboratory.

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NEW WILT OF COTTON — A PHYSIOLOGICAL DISORDER CAUSED BY SYNTHETIC PYRETHROIDS

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THE new wilt of cotton is a serious problem characterized by drooping of leaves, chlorosis and premature defoliation. Some hybrids such as MECH 1, JKHY 1 and DCH 32 are highly susceptible to this malady. This disorder, first reported in 1978 when the incidence was very low, later became a serious problem. From about the same time, the widespread use of synthetic pyrethroids for the control of bollworms was started in cotton. This coincidence naturally raised a question whether there is any relationship between the new wilt incidence and the use of synthetic pyrethroids. An experiment was therefore conducted to study the effect of synthetic pyrethroids on the incidence of new wilt. The preliminary findings are reported here.

Two hybrids, one highly prone to new wilt (MECH 1) and the other tolerant (H4), were sown at this Institute in a 4.5×3 m plot during the first week of July 1987, in a randomized block design with 6 replications. The spacings between the rows were 90 cm and that between the plants were 60 cm. The treatments were:

T_1: Control (water spray).
T_2: Three sprays of cypermethrin at 55 g a.i. per hectare, first at early square formation stage and the subsequent at 20 day intervals.
T_3: Five sprays of cypermethrin at 55 g a.i. per hectare, first at early square formation stage and the subsequent at 10 day intervals.

Normal culture practices were followed. Observations on a number of wilted plants were recorded at the initiation of boll-bursting stage and the per cent incidence of new wilt was calculated for each treatment. Angular transformation was applied and the data were analysed statistically.

Application of cypermethrin, a synthetic pyrethroid induced the development of the new wilt disorder in susceptible hybrids. The incidence increased with an increase in the number of sprays. In control plants, the new wilt was almost negligible. Cypermethrin, however, failed to induce wilting in the tolerant hybrid H4.

The present results suggest that the synthetic pyrethroid has a role to play in the incidence of new wilt disorder in susceptible hybrids of cotton. This agrees with earlier findings[2,3].

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