Table 3 *Coefficient of correlation between nitrate reductase and nitrogenase activity at different crop growth stages*

Characters	Nitrate reductase activity 45 days	Nitrate reductase activity 55 days	Nitrogenase activity per plant 25 days	Nitrogenase activity per plant 45 days	Nitrogenase activity per plant 55 days
Nitrate reductase activity					
25 days	0.83**	0.80**	–0.69*	–0.61*	–0.52
45 days	–	0.89**	–0.54	–0.72*	–0.67*
55 days	–	–	–0.63*	–0.58*	–0.65*
Nitrogenase activity per plant					
25 days	–	–	–	0.72**	0.66*
45 days	–	–	–	–	0.70*

* Significant at 5% level; **Significant at 1% level.

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USE OF PHYTOHORMONES IN SYNTHESIS OF *BRASSICA NAPUS* L.

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ARTIFICIAL synthesis of *Brassica napus* from its diploid progenitors *B. campestris* and *B. oleracea* is receiving increasing attention in recent times[1–3]. However, because of interspecific incompatibility, the frequency of hybrids obtained has been low. Several *in vitro* methods such as ovary, ovule or embryo culture have been used to increase the frequency of hybrids[4,5]. But there are difficulties in following these methods caused by the low retention time of pollinated ovaries, small size and low number of fertilized ovules and specific osmotic and nutritional requirements of very small embryos. If ovaries, ovules or embryos can be retained on the plant and allowed to develop to a stage when *in vitro* methods can be more accessible, interspecific hybrids can be synthesized at a higher frequency. Phytohormones have been successfully used to this end in some interspecific crosses in *Arachis*[6]. In this paper the usefulness of phytohormones in the synthesis of *B. napus* from the cross *B. c.* ssp. *chinensis* × *B. o.* var. *capitata* is examined.

NAA, GA_3 and Kn were used singly and in combination (GA_3 + NAA and Kn + NAA) at concentrations of 10^{-5}, 10^{-5} and 10^{-6} M respectively. For single hormone treatments, a swab of cotton wetted with the hormone solution was wrapped around the ovary after pollination. A total of five applications of the hormone were given on alternate days. For the combination treatments, the pistils were treated alternately with each hormone over a period of 10 days. As control, the incompatibly

Table 1 *Effect of NAA, GA_3 and K_n on the cross B. c.* ssp. *Chinensis* × *B. o. var. capitata*

Treatment	Pistils pollinated	Increase in ovary length 15 DAP (cm)	Ovules containing embryos 20 DAP(%)
Water	20	2.4	–
NAA	60	3.2	–
GA_3	100	3.4	–
Kn	60	3.7	10
(GA_3 + NAA)	65	3.6	–
(Kn + NAA)	50	3.8	20

pollinated pistils were treated with water. The mean length of five ovaries was measured on the day of pollination and 15 days after pollination (DAP) for each treatment. Ovules from 10 pistils were dissected 20 days after pollination to observe embryos. The experiment was carried out during *rabi* 1984–85.

There was an increase in length of ovaries over control in all the five treatments (table 1). The increase was maximum with (Kn + NAA) and least with NAA. The ovules in each treatment were larger than in the control.

No embryos were observed in the ovules of the untreated pistils and also in the absence of kinetin in the treated pistils. Embryos were observed only in pistils treated with Kn and (Kn + NAA). In both cases, they were at the globular stage of development 20 days after pollination. However, in the combination treatment, the number of ovules with embryos was twice as many as those which received only Kn applications.

Thus application of kinetin, either singly or with NAA to incompatibly pollinated pistils promoted fertilization and embryo development. In addition, it also led to an increase in size of the ovules and ovaries. The chances of obtaining interspecific hybrids from the above cross by subsequent use of *in vitro* techniques are thereby increased. The present studies can lead to synthesis of *B. napus* at higher frequencies.

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PLANT REMAINS FROM BANAWALI, HARYANA

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THE carbonized plant remains recovered from the Harappan levels in the mound at Banawali in Tehsil Fatehabad, District Hissar, Harayana (recovered by the flotation process) comprise wheat and barley grains, a pulse and graminaceous culms and charcoals. Earlier, barley[1] and wheat[2] were reported from this site.

The wheat grains are oval to subglobular rather plumpy, about 4–5 mm long and 2.5–3.5 mm broad with embryo preserved at the base of dorsal surface. Thin-walled parenchyma cells are observed on the surface of these grains. They look like those of *Triticum aestivum* (figure 1).

The barley grains are longish in shape, flat on the dorsal side and somewhat pointed on both the ends. They are 5–5.5 mm long and 2.5–3 mm broad. A furrow is seen on the ventral side. They are identified as *Hordeum* sp. (figure 2).

The seeds with a lateral hilum, oblong in shape, with a thin and smooth seed coat and about 4–4.2 mm long and 2.5–2.8 mm broad are distinctly papilionaceous in character. They appear to be like those of *Vigna mungo* (figure 3).

Cursary examination revealed that the graminaceous culms (figure 4) may belong to cereals or wild grasses and the charcoal pieces belong to some dicotyledonous plants. Detailed investigation and identification are in progress.

Recovery of *Vigna mungo* at this site (*c.* 2300 B. C.) is the earliest record in India.

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