4. Boidin, J., Terra, P. and Lanquetin, P., *Bull. Soc. Mycol. France*, 1968, **84**, 53.
5. De, A. B., *Curr. Sci.*, 1977, **48**, 58.
6. Macre, R., *Mycologia*, 1955, **47**, 812.
7. Roy, A. and De, A. B., *Mycologia*, 1979, **71**, 655.
8. Sen, M. and Sehgal, H. S., *Can. J. Bot.*, 1967, **45**, 635.

A NEW APPROACH TO PAPAYA PROPAGATION

R. N. SINGH, O. P. RAO and GORAKH SINGH
Department of Horticulture, Institute of Agricultural Sciences, Banaras Hindu University, Varanasi 221005, India.

PAPAYA is commercially propagated by seed. This leads to variation and a varietal name becomes misnomer. Even after six or seven generation of inbreeding only a maximum of 90% homozygosity is attained. Hence to perpetuate the papaya true to the type, utilization of some easy method of vegetative multiplication is necessary. In the past, some attempts were made in this regard[1-4]. However, due to quite variable and low success in vegetative propagation, the same has not been used commercially. So far no information is available on the success of budding during different seasons in India. An attempt was, therefore, made in the present study to the efficacy of budding with a view to multiply papaya vegetatively.

Stock seedlings were raised from mixed seed of papaya and transferred to pots when these had attained a height of about 8 cm. When the seedling attained a diameter of 1 to 1.5 cm, these were ready for budding. For scion material, the vigorous female plants of Pusa Dwarf papaya were cut back to induce axillary growth (figure 1). Side shoots emerging from below the stump, having a length of 24 cm and 1.2 cm diameter, were taken for bud wood. In this regard juvenelity of the plant has to be given due consideration. It was observed that the female plant cut at a height of 30 cm to 60 cm gives rise to shoots which have vegetative buds. At a higher level the emerging shoots will have reproductive buds only. Using the above rootstock and Scion material, patch and shield budding was done during July, August, September and October. The top of the seedling stock was removed after a week of budding. The buds sprouted after 15 days of budding and attained sufficient length after a month (figure 2).

Figures 1, 2. 1. Axillary growth after heading back (30 cm) height. **2.** Growth of scion after a month of budding (Patch).

It was observed that patch budding gave better success than shield budding (table 1). The highest success of 90% take was obtained in patch budding when done in the first fortnight of September closely followed by 80% in the second fortnight of August, whereas in shield budding good success was obtained (80%) when done in the first fortnight of September.

It appears that timing is vital for the success of budding in papaya apart from other factors such as suitable rootstock and bud stick. This may be due to congenial temperature, rainfall and humidity. Favourable humidity conditions for good success and growth have been emphasised by a number of workers[5-6].

The present work has shown that under agro-climatic conditions of Varanasi, patch budding should be practiced during August and September for successful vegetative multiplication of the papaya. Since the success obtained ensures its commercial adaptability for the first time in India, this may revolutionise the cultivation of papaya.

Table 1 *Seasonal effect on success in different methods of budding in papaya*

Time of budding	Success (%)	
	Patch budding	Shield budding
30th July	60 0	37 5
30th August	80 0	56 0
15th September	90 0	80 0
15th October	50 0	40 0

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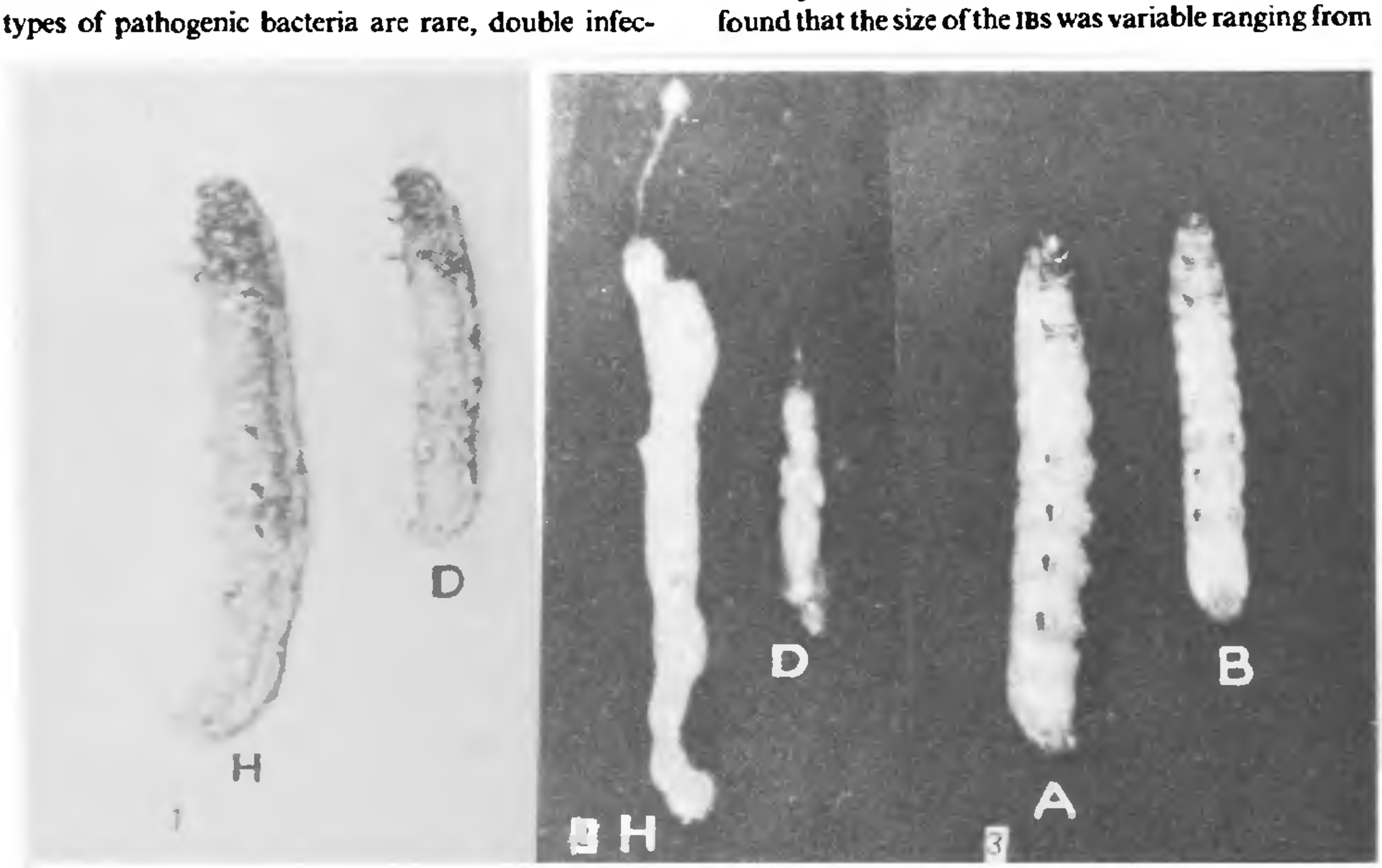
1. Allan, P., *Fmg. S. Afr.*, 1964, 39, 35
2. Jimenez, H., *Agron. Trop. Venezuela*, 1957, 7, 33
3. Lange, A. H., *Hort. Sci.*, 1969, 4, 304
4. Riccelli, M., *Trop. Marcary*, 1963, 13, 157
5. Hartman, H. T. and Kester, D. S., *Plant propogation principles and practices*; 1972, Prentice Hall Inc. Eaglewood Cliffs, New Jursey.
6. Shippy, W. B., *Am. J. Bot.*, 1939, 17, 290

THE OCCURRENCE OF MIXED INFECTION OF VIRUSES IN *SPODOPTERA LITURA* F.

K. NARAYANAN
Division of Entomology/Nematology,
Indian Institute of Horticultural Research,
Hessaraghatta, Bangalore 560089, India.

THOUGH mixed infections of insects with different types of pathogenic bacteria are rare, double infections with viruses and/or protozoans have been observed in many lepidopterous insects[1]. In India, mixed infection of nuclear polyhedrosis virus (NPV) and granulosis virus (GV) in *Pericallia ricini*[2], and of GV and microsporidian, *Nosema* sp, in *Spodoptera litura*[3] have been reported. During the course of our laboratory rearing of *S. litura*, some of the larvae lagged greatly behind the normal larvae in their development, and they were recognised by their small size, loss of appetite and chalky white appearance of the abdomen (figure 1). On dissection of those suspected larvae, instead of transluscent, and pale green colour of the normal midgut, the gut was opaque and light white in colour and thinner in size (figure 2). On examination of the midgut tissue in wet mounts, with use of phase-contrast microscope, revealed numerous round and more or less sperical-shaped inclusion bodies (IB) emanating from the ruptured cells. Samples from some of the insects for which positive diagnosis has been made with light microscope were further confirmed with staining following the procedure of Sikorowski *et al*[4]. To determine the size of IBs, 100 of them were measured at random, under a pre-calibrated phase-contrast research microscope and readings were taken at 400 × magnification and it was found that the size of the IBs was variable ranging from



Figures 1–3. 1. Effect of CPV on the larva of *Spodoptera litura*, **2.** Effect of CPV on the gut of *S. litura* (Note the small and thin sized gut of CPV infected *S. litura*.) **3.** Effect of GV+CPV infected *S. litura*. (H-healthy, D-diseased, A-GV infected and B-GV+CPV infected.)