conceived to be so, due to the absence of planktonics other than *Guembelitria* in the much-condensed Gredero and other sections of Zone P0.

The first appearance of *Chiloguembelina morsei* and *Turborotalia eugubina* (Figure 2, *e, f*) is seen in sample J85–32, 150 cm above the K/T iridium layer. In this sample development of reticulation in the Tertiary planktonic tests is also well seen from the very initial state (Figure 2, *f, g*) to typical subbotinid *Globigerina* (Figure 2, *j*). Similar but large forms prevail (Figure 2, *i*) in the higher P1.

The K/T boundary changes in Meghalaya commence from 0.5 m below the K/T layer and continue up to 1.5 m above the iridium layer. These include not only the extinction of the Cretaceous *Globotruncana-Rugoglobigerina–Hedbergella–Heterohelix* assemblage but also the appearance and diversification of Tertiary planktonics. What, then, is the actual taxonomic status of the species referred to *G. aegyptica* and *G. gansseri* by Lahiri *et al.* from the *G. pusilla* Zone[1]? Their obscurely illustrated '*G. gagnebini*', being non-keeled and non-rugose, is possibly not a *Globotruncana*, much less *G. aegyptica*. Neither of their reported species is recorded from the Um Sohryngkew river in my repeated studies, hence good SEM illustrations of the forms with the sample location on the traverse line in Figure 1, *b*, are necessary to establish their point[4].

Note added in proof Erratum to Figure 1, *c*: Measured and true stratigraphic thickness reversed.

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Gamma irradiation and ethyl methanesulphonate-induced changes in cotton seed oil content

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Gamma irradiation and ethyl methanesulphonate treatment of seeds of two cotton cultivars resulted in overall increase in oil content.

STUDIES on induced mutations for oil in cotton seed are limited[1,2]. In the present study, mutagenic changes in seed-oil content and in seed cotton yield and its components were examined. Contemporary cultivars 'L147' and 'Laxmi' belonging to *Gossypium hirsutum* Linn. were selected. One set of seeds was treated with 0, 5, 10, 15, 20, 30 and 40 kR of gamma rays in 1982 and the other with 0, 0.05, 0.1, 0.3, 0.6, 1.0 and 1.5% solution of ethyl methanesulphonate (EMS) in 1983. The M1 generation of irradiated material was sown in the regular season (June–Dec.) of 1982, while that of EMS-treated material was sown in the off-season (Jan.–May) of 1983. M2 and subsequent generations of irradiated and EMS-treated plants were grown in regular seasons beginning with 1983–84. In the early generations, groups of plants were selected and carried forward on bulk basis, while in advanced generations single plants were selected and single plant/progeny selection method was followed for improvement. Twelve normal-

Table 1. Comparative performance of some high yielding M4 and M5 progenies for oil content and yield.

Progeny	Cultivar	Generation	Dose	Seed cotton yield (kg/ha)	Oil (%)	Oil index (mg)
Gamma						
P 6/20	Laxmi	M4	5 kR	1711	23.7	23.49
P 7/21	Laxmi	M4	5 kR	1778	21.5	20.15
P 20	Laxmi	M4	5 kR	2241	21.8	21.04
P 21	Laxmi	M4	5 kR	1707	21.7	19.68
P 54	L147	M5	10 kR	1651	22.9	12.98
EMS						
P 18/38	L147	M4	0.05%	2015	24.0	19.20
P 19/38	L147	M4	0.05%	1737	23.0	16.45
P 20/38	L147	M4	0.05%	1704	23.5	18.14
P 28/46	L147	M4	1.5%	1767	21.6	15.00
P 38	L147	M4	0.05%	1733	23.7	18.98
P 43	L147	M4	1.5%	1748	24.5	18.60
P 44	L147	M4	1.5%	2407	22.8	14.27
P 70	L147	M5	0.05%	1900	22.1	16.46
P 74	L147	M5	0.1%	1827	24.4	16.96
P 78	L147	M5	0.1%	1981	23.0	14.21
Control						
Laxmi				944	19.6	13.33
L147				1285	21.3	14.85
SRT-1 (Cultivar)				1056	20.1	13.27
S. Em				84.48	0.33	0.71

looking M2 plants from each dose/concentration were randomly selected and advanced to M3. In M3, a group of 20 normal-looking plants with visual improvement in yield, earlines and other economic characters were selected from each dose/concentration. Selected superior plant/elite progenies were advanced from M4 onwards. Overall 114 M4 and M5 (gamma and EMS) mutant progenies were evaluated in 1986 for yield and other economic characters. Oil content in 10 g samples of delinted and dried seeds from 15 high-yielding M4 and M5 mutant progenies and their parents was determined on a Newport NMR analyser. Oil index, which is the weight of oil per seed in mg, was obtained by multiplying seed index and oil percentage and dividing by 10.

The results showed that 13.15% of the M4 and M5 progenies were high yielders. Seeds of all these elite progenies showed an overall increase in oil percentage and oil index over respective parents as also over the standard cv. SRT-1 (Table 1). Two high-yielding progenies (P 20 of Laxmi at 5 kR gamma and P 18/38 of L147 at 0.05% EMS) had relatively higher levels of oil. Progeny P6/20 of Laxmi at 5 kR gamma had increased levels of both oil percentage and oil index (Table 1) which were significantly higher than Laxmi. In general, oil index was higher in gamma progenies and oil percentage in EMS progenies. Thus induced mutations can help in obtaining simultaneous improvement of seed yield and oil content in cotton.

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Influence of associative rhizobia on yield of chickpea and soybean

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Seed inoculation with pea, soybean, mung and *Cicer-Rhizobium* of two cultivars of chickpea (Pusa 256 and 261) was adapted to study their associative effects on growth and nitrogen assimilation. Nitrogen enrichment and increase in grain yield occurred as a result of seed bacterization. Similar beneficial effects on yield of non-nod (T-201) and nod (T-202) isolines of soybean were observed due to inoculation with a strain of *Bradyrhizobium japonicum*. The root system of non-nodulating isoline was completely free of nodules.

AMONG the highly promiscuous tropical legumes, chickpea is known to exhibit somewhat more specific requirement for the *Symbiotic Rhizobium*[1]. Soybean is another legume which is susceptible to invasion by specific rhizobia. Rhizobia carry the genetic information required for reduction of atmospheric nitrogen. Taxonomically diverse group of plants are known to derepress these *nif* genes in rhizobia[2]. Certain non-nodulating isolines of soybean resist invasion by most rhizobia. It is thus clear that elaborate symbiosis may not be always necessary to derive benefits of such plant–rhizobial associations. Results of two such preliminary experiments are described below. Two chickpea cultivars Pusa 256 and Pusa 261 were grown in pots. The seeds were inoculated with strains of *Cicer-rhizobium* (F-75) *Bradyrhizobium japonicum* (SB-16), *R. leguminosarum* (2009) and a strain from green gram (*Vigna radiata* L., M-10). These strains were obtained from the Division of Microbiology, Indian Agricultural Research Institute, New Delhi. Urea and single superphosphate (N_{20} and P_{60} kg ha^{-1}) were applied at the time of planting. During *kharif* season non-nodulating and nodulating isolines T 201 and T 202 respectively of soybean were inoculated with an effective strain of *Bradyrhizobium japonicum* (SB-16) and grown in pots. The non-nodulating isoline received 80 kg N and nodulating isoline 20 kg urea-N ha^{-1} and 60 kg P_2O_5 ha^{-1} as single superphosphate. Yield data were recorded in both the experiments.

Seed inoculation with *Cicer*, soybean and pea *Rhizobium* increased number and fresh weight of nodules, grain, dry matter and nitrogen content of plants in case of Pusa 256 (Table 1). Variation in fresh weight of nodules of Pusa 261 was observed. Plants of this cultivar were infested with disease and died hence no further data could be recorded.

Unlike many promiscuous tropical legumes, chickpea plants are nodulated by some specific rhizobia. It is, therefore, unlikely that heterologous rhizobia used for inoculation in this experiment have produced nodules on chickpea. Data on average number of nodules per plant indicate natural variation among the treatments. Increase in fresh weight of nodules over the control in Pusa 256, a better nodulating variety than cv. 261, may be ascribed to synergistic effect of inoculated rhizobia on native rhizobia × plant genome interactions. Nitrogen content of plants inoculated with different rhizobia also supports such synergistic response. Inoculation with non-invasive diazotrophic bacteria, viz. *Azospirillum*[3] and *Azotobacter*[4] has been shown to enhance nodulation and yield of legumes.

To sum up, *Cicer* and soybean rhizobia increased yield and nitrogen content of chickpea, while *Rhizobium* from green gram had favourable effect on grain yield.

The non-nod isoline of soybean (T-201) supplied with urea (80 kg N ha^{-1}) and rhizobial inoculation produced more grain yield than uninoculated non-nod (80 kg N ha^{-1}) and nodulating (20 kg N ha^{-1}) isolines (Table 2). Inoculated nod isoline T 202 (20 kg N ha^{-1}) of soybean, however, produced more grain than all other treatments. No nodules were observed in non-nod isoline (T 201) while the same strain of *Rhizobium* enhanced number of nodules in nodulating isoline. Thus a *nod*$^+$, *fix*$^+$