Figure 5. Water soaked lesions with dark brown margin on bolls and bracts.

The pathogenicity of basidial culture was tested on cotton leaves and bolls by placing agar culture. On leaves, the affected tissues were characterized by a clearly defined, water soaked area that progressed rapidly. Within a short time the infected area collapsed and bacame flaccid, turning from a deep green to a dead brown. More or less concentric zones of alternating light and dark brown were observed (figure 4). On bolls and bracts it produced water soaked lesions with marked dark brown margin (figure 5).

In studying the possible sources of infection and means of dissemination of basidiospores to the leaves and bolls of cotton plants, artificial inoculation was made with basidial culture on the leaves of other plants growing in close proximity. A typical web blight symptom appeared on *Vigna unguiculata* L., *Phaseolus mungo* var. *radiatus* L., *Phaseolus aureus* Roxb., *Glycine Max* Merr., and *Cajanus cajan* (L.) Millsp., 20 days after inoculation. The aerial blight symptoms on these hosts appeared to be similar to that of aerial blight of snap bean[8] and soybean[9]. On paddy, typical sheath blight symptom (figure 6) appeared 10 days after inoculation. All these hosts gave evidence as a carrier of the disease, thus ensuring probable spread of basidiospores. It would seem, therefore, the infection of the cotton leaves and bolls may have occurred through dissemination of basidiospores by wind or other agencies. The pathogenicity of basidiospores lead us to consider it as of potential economic importance in cotton-producing areas.

Figure 6. Typical sheath blight symptom produced on rice.

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GROWTH REGULATORS AFFECT NECTAR-POLLEN PRODUCTION AND INSECT FORAGING IN BRASSICA SEED CROPS

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Although the role of plant growth regulators is now well established in the improvement of seed germination, promotion of plant growth, sex modi-

fication, flowering, induction of male sterility, promotion of parthenocarpy, fruit set, fruit shape and size, fruit maturity and ripening, weed control, control of apical dominance and grain filling of pods[1], yet no information is available on the effect of growth regulators on quantity and quality of nectar and or pollen production in entomophilous crops. Shuel[2,3] conducted experiments on the effect of growth regulators on nectar secretion in excised flowers of *Antirrhinum majus* L. cultured in sugar solution under laboratory conditions. The effect of growth regulators on flower, nectar and pollen production would greatly determine the foraging activity of insect pollinators as also the ease of the availability of the floral rewards to them. Keeping above facts in view investigations were carried out with four growth regulartors, viz. gibberellic acid (GA_3), naphthalene acetic acid (NAA), indole acetic acid (IAA) and indole butyric acid (IBA) which were used at normal recommended doses, i.e. 80, 160, 5 and 10 ppm, respectively on mustard (*Brassica campestris* L. var. *sarson*) and cauliflower (*Brassica oleracea* L. var. *botrytis*) seed crops. The results are summarised in table 1.

Pollen production and its viability

Higher number of pollen grains per flower in mustard (77185.88) and cauliflower (65036.33) were recorded in GA_3-treated plants followed by NAA, IAA, IBA treatments and the control plants. Pollen viability was also not affected by these growth regulators in the two *Brassica* crops.

Volume and concentration of nectar

Flowers from plants treated with GA_3 had maximum volume of nectar per flower in mustard (1.25 μl) and cauliflower (1.81 μl) followed by flowers from NAA, IAA and IBA treatments. The untreated plants had the least amount of volume of nectar per flower. The sugar concentration of nectar in mustard (51.75%) and cauliflower (31.15%) was maximum in GA_3-treated plants which was followed by plants treated with NAA, IAA, IBA and the control. Among different growth regulators, flowers from GA_3-treated plants produced maximum amount of dry nectar sugar per flower in mustard (4.77 mg) and cauliflower (3.46 mg) while flowers from NAA, IAA and IBA-treated plants produced lesser quantity of dry nectar sugars. The untreated plants had the lowest amount of dry nectar sugars (2.26 mg in mustard and 1.50 mg in cauliflower).

Relative abundance of insect visitors

Relative abundance of flower-visiting insects on mustard and cauliflower in GA_3-treated plants was maximum (2.09 and 1.93 insects/m^2/5 min) followed by NAA, IAA and IBA treatments, while untreated plants attracted the least number (1.03 and 1.05 in mustard and cauliflower).

Table 1 *Effect of growth regulators on nectar, pollen, insect abundance and seed yield in Brassica spp.*

Treatments	No. of pollen grains/flower		Nectar vol./flower (μl)		Nectar conc. (%)		Dry nectar sugar/flower (mg)		Insect abundance (m^2/5 min)		Seed yield* (qtls/ha)	
	C	M	C	M	C	M	C	M	C	M	C	M
GA_3	65036.33 (4.8143)	77185.58 (4.8862)	1.81	1.25	35 15	51.75	3.46	4.77	1.93	2.09	13.33	11.90
NAA	54899.66 (4.7329)	63253.14 (4.8016)	1.71	0.98	33.47	48.01	2.37	3.66	1.64	1.42	10 42	10.82
IAA	55283.88 (4.7419)	69637.83 (4.8427)	1.33	0.84	33.30	46.91	2.37	3.14	1.44	1.31	9.73	10.25
IBA	52027.21 (4.7161)	61064.83 (4.7843)	1.11	0.99	33.13	45.93	2.63	2.52	1.57	1.38	9.33	9.17
Control	29219.41 (4.4650)	34673.10 (4.5421)	0.91	0.56	31.38	41.68	1.50	2.26	1.05	1 03	7.15	6.97
C.D.(0.05)	(0.0659)	(0.0432)	0.31	0.17	0.50	1.60	0.40	0.52	—	—	—	—

C, Cauliflower; M, Mustard; *Yield (qtls/ha) estimated on the basis of yield per experimental plot.

Yield parameters

Besides above effects, yield parameters such as the number of flowers per plant, number of pods per plant, number of seeds per pod and seed yield were more in growth regulators treated plants as compared to control. Results on seed germination showed that the application of growth regulators did not hinder the germination of resulting seeds in respective crops.

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COLLETOTRICHUM FOLIAR INFECTIONS ON *LEUCAENA LEUCOCEPHALA* IN KERALA, INDIA

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Leucaena leucocephala (Lam) de Wit, a multipurpose fast growing tree species, is being raised extensively in Kerala. Foliar infection on 3-year-old trees planted in KFRI campus was observed during May–July 1985 and 1986. Usually, infection occurred on lower branches on the adaxial surface of the leaf rachis. Under high humidity, the lesions spread to the entire length of the rachis and also to the petiole, midrib and veins of the leaflets. However, the lesions did not spread to the leaf lamina. Infected leaves showed pale yellow discoloration and flaccidity and defoliated within a few days of infection leaving behind the discoloured leaf rachii alone. Isolations made from the infected tissues consistently yielded *Colletotrichum crassipes* (Speg.) V. Arx (IMI 302782).

Colletotrichum crassipes

Colony on PDA tast growing, greyish brown to black, with dark greyish brown aerial mycelium; colony reverse bluish black. Setae present. Conidia hyaline to pale brown, straight, thick-walled, smooth, obtuse at the apices, 17.5–31.5 × 6.3–7.2 μm.

Another foliar infection observed during February–April 1986 caused lesions on the leaves in lower branches and also on leaves of ca. one-year-old naturally regenerated seedlings in the trial plot. Infection appeared as greyish brown circular to oval lesions, with a greyish white centre 1–3 per leaflets measuring 2–3 mm in dia. Under high humidity, fungal spore mass was observed at the centre of the lesions. In the case of severe infection, yellowing and falling off of the leaflets occurred. Isolations from the leaf lesions yielded *Colletotrichum gloeosporioides* (Penz.) Sacc. (IMI 302785).

Colletotrichum gloeosporioides

Colony on PDA fast growing, greyish white with abundant aerial mycelium. Conidia hyaline, straight to slightly bent, aseptate, guttulate, obtuse at the apices, 11–16 × 2.2–3 μm.

Pathogenicity of *C. crassipes* and *C. gloeosporioides* was tested by spraying the spore suspensions of the respective fungal isolates to the intact leaves separately. High humidity was maintained by covering the inoculated leaves by moistened polybags. Disease symptoms developed after four days of incubation. The pathogens were reisolated from the respective infected tissues and the pathogenicity confirmed.

So far, only a few diseases have been recorded on *L. leucocephala*[1–13]. *Sclerotium rolfsii*[6], *Phomopsis leucaenae*[10] and *Fusarium semitectum*[9] are the important pathogens recorded from India. *C. crassipes*, a weak pathogen recorded from different crops[11] and *C. gloeosporioides*, a ubiquitous pathogen causing foliar infections on various forestry crops[14] are new records on *L. leucocephala*.

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