

Studies on Witches Broom of Moth Bean

G S Rathore, V L Majumdar and R S Champawat

Department of Plant Pathology, Rajasthan Agricultural University,
SKN College of Agriculture, Jobner— 303 329 India

Abstract Yield of moth bean (*Vigna aconitifolia*) reduced by 88.75% at 100% to that at zero per cent disease severity. Per cent loss in yield plant⁻¹ increased progressively with increasing disease severity. Plant growth parameters of diseased plants were significantly reduced as compared to healthy plants. Spray of 250 ppm tetracycline hydrochloride suppressed the symptoms of mycoplasma and increased the growth of plant. Seventy one varieties were screened against mycoplasmal witches broom, out of which only 25 were found to be completely resistant.

Key words Yield, Plant growth, Witches broom, Moth bean.

Moth bean (*Vigna aconitifolia* Jacq. Marechal) is one of the important pulse crop grown extensively in the arid and semi arid areas of Rajasthan. Among the diseases, witches' broom caused by mycoplasma is very prominent one, and it exhibit severe reduction in leaf lamina, shortening of internodes, and phyllody of flowers. Similar witches' broom syndrome in other plant species has earlier been also reported by Pandey *et al.* (1976) and Kara *et al.* (1982). The causal agents of such diseases have been reported to be susceptible to antibiotics (Shikata *et al.* 1969). A field experiment was conducted to investigate the efficacy of Tetracycline hydrochloride in suppressing the witches' broom syndrome, estimation of losses in yield, effect on plant growth, and screening of germplasm for disease resistance under natural conditions.

Materials and Methods

The experiment (RBD) was conducted during *kharif* (June- September of 1985 and 86) at Research farm of SKN College of Agriculture, Jobner with three replications, using a highly susceptible cultivar *Jadia*.

Estimation of per cent disease incidence was made by counting healthy and diseased plants at 30 sites (3 x 3 m) on Research farm, Jobner and neighbouring fields.

To study the efficacy of Tetracycline hydrochloride in suppressing the witches broom syndrome, diseased and healthy plants just before

the flowering stage were uprooted, placed in earthen pots and kept under insect free conditions. Each treatment had three replications. Aqueous solution of Tetracycline hydrochloride (250 ppm) was sprayed twice at an interval of 10 days. Control plants were sprayed with water only. The plants were observed for new growth and change in symptoms. The growth parameters of plants were recorded at an interval of 20 days after the first spray.

For the estimation of loss in yield, three plants of each category of disease severity (0,25,50,75 and

Table 1 Effect of mycoplasma witches broom of moth on plant growth parameters and yield.

| Growth parameters | Diseased* | Healthy* |
|--|-----------|----------|
| Plant height (cm) | 16.15 | 34.16 |
| Fresh plant weight (g) (including root & pods) | 13.43 | 48.42 |
| Dry plant weight(g) (including root & pods) | 3.61 | 18.35 |
| Root length (cm) | 10.41 | 16.65 |
| Number of primary branches (Plant ⁻¹) | 2.33 | 5.83 |
| Number of secondary branches (plant ⁻¹) | 11.00 | 25.16 |
| Number of pods plant ⁻¹ | 20.33 | 111.66 |
| Number of seeds pod ⁻¹ | 2.33 | 6.83 |
| Seed weight plant ⁻¹ (g) | 3.30 | 16.65 |
| 1000- grain weight (g) | 14.78 | 31.63 |

* Average of six plants

100%) were tagged and yield plant⁻¹ was recorded. Estimation of loss in yield was calculated, taking yield of healthy plant.

To study the effect of witches' broom on plant growth and yield, six diseased and six healthy plants were tagged and harvested when mature. Observations on growth character (Table 1) were recorded and subjected to standard statistical analysis.

For screening disease resistance of varieties, seventy one lines were evaluated during 1989 in RBD with three replications in plot of 2x1 m with row to row and plant to plant distance of 50 and 15 cm respectively. At 50% flowering stage per cent disease incidence was recorded. All the germplasm were rated into six categories :

| Infection % | Rating |
|-------------|---------------------------|
| 0 to 5 | = Resistant |
| 5.1 to 15 | = Predominantly resistant |
| 15.1 to 25 | = Moderately resistant |
| 25.1 to 50 | = Moderately susceptible |
| 50.1 to 75 | = Susceptible |
| 75.1 to 100 | = Highly susceptible |

Results and Discussion

Witches' broom of moth was observed to be quite severe around Jobner. The disease was observed to be transmitted by the jassid *Amrasca biguttula biguttula* (Ishida). Average population on the vector plant⁻¹ worked out to be 20.42. The disease incidence varied between 14.28 to 70.58% at different location.

Table 4 Reaction of moth bean germplasm to mycoplasmal witches broom

| Categories | Germplasm |
|--------------------------------------|---|
| Resistant (0-5%) | IPCMO - 118, 138, 267, 271, 273, 274, 336, 348, 349, 350, 364, 448, 519, 520, 596, 620, 650, 803, 813, 814, 912, 913, 914, 951, 951 |
| Predominantly resistant (5.1-15%) | IPCMO - 313, 324, 338, 344, 346, 595, 675, 684, 688, 744, 751, 790, 961 |
| Moderately resistant (15.1-25%) | IPCMO - 115, 306, 310, 316, 347, 383, 441, 446, 474, 490, 557, 619, 690, 691, 696, 950, 997 and Local |
| Moderately susceptible (25.1-50%) | IPCMO - 262, 303, 335, 386, 486, 529, 558, 612, 681, 719, 782, 796 and Jadia |
| Susceptible (51.1-75%) | IPCMO - 547 and Jwala |
| Highly susceptible (75.1-100%) | - Nil |

Table 2 Loss in yield of moth at different severity level due to mycoplasmal witches broom

| Disease severity (%) | Yield (Plant ⁻¹) | Loss in yield (%) |
|----------------------|------------------------------|-------------------|
| 0 | 9.63 | - |
| 25 | 6.10 | 36.67 |
| 50 | 4.02 | 58.30 |
| 75 | 2.65 | 72.48 |
| 100 | 1.08 | 88.75 |

* Average value of a replications.

Different categories of disease severity showed significant differences in the yield (Table 2). The yield progressively decreased from zero per cent disease severity to 100% disease severity and per cent loss increased progressively from 36.67 at 25% disease severity to 88.75% at 100% disease severity, based upon no loss at zero per cent disease severity. Average values of growth parameters of diseased plant showed significant reduction compared to

Table 3 Growth (height in cm) of healthy, mycoplasma affected, and mycoplasma affected tetracycline (250 ppm) treated moth bean plants.

| Date of treatment | Healthy (check) | Diseased (check) | Diseased (treated) |
|---------------------------|-----------------|------------------|--------------------|
| 15.9.85 (first spray) | 25.0 | 18.0 | 18.5 |
| 25.9.85 (Second spray) | 28.5 | 20.0 | 21.0 |
| 5.10.85 | 30.7 | 20.8 | 24.0 |
| 15.10.85 | 34.0 | 23.5 | 29.3 |

healthy (Table 1). The reduction in the number of pods (Table 1) appeared to be most important factor which brought about reduction in yield, as also evident by reduced seed weight plant⁻¹ and thousand grain weight in diseased plants compared to healthy plants.

Effect of tetracycline hydrochloride indicated that the rate of growth increased in the tetracycline treated plants compared to the diseased check and healthy plants (Table 3). Kara *et al.* (1985) reports efficacy of antibiotic in suppressing the symptoms in case of mycoplasmal diseases.

Out of 71 varieties screened under natural conditions, twenty five varieties as moderately resistant, thirteen varieties as moderately susceptible, two varieties were considered as susceptible with 50.1 to 75% and none of the varieties had more than 75% disease incidence to be classified as highly susceptible (Table 4).

References

- Kara RK, Nanda HP & Kabi T 1982 Little leaf of *Catharanthus roseus* in India. *Science and Culture* **48** 180-182
- Kara RK, Kabi T & Patnaik H 1983 Chemotherapy of periwinkle little leaf disease *Current Science* **52** 496-497
- Pandey PK, Singh AS, Nimbalkar NR & Marathe TS 1976 A witches broom disease of jujube from India. *Plant Disease Reporter* **66** 301-303
- Shikata E, Eng WS & Matsumoto T 1969 Mycoplasma or PLT like micro-organisms detected in leaves of sugarcane plant infected with white leaf disease and the suppression of the disease symptoms by the antibiotics of tetracycline group. *Journal of Faculty of Agriculture, Hokkaido University, Japan* **56** 79-90
- Zhang JN, Wan HB, Chen BG & Liu ZJ 1985 Effect of antibiotics on bunchy top of china tree (*Melia azedarach*) and infected leaf hoppers. *Acta Phytopathologica Sinica* **15** 47-52

(Received September 1992 Accepted April 1993)