(73% and 16%, respectively). However, there were more non-viable eggs in manually treated beans than tumbler treated beans (258 eggs and 118 eggs, respectively). Adult mortality was higher in tumbler treated than the manually treated beans (Table 1). The oil concentration had variable effects on various parameters. The weevil mortality was highest with 3 ml oil/kg seeds in both tumbler and manual treated beans. The number of viable eggs, % viable eggs and the number of F1 progeny emerging all decreased with increasing oil concentration in tumbler treatments. However, with manual treatments, the effects were opposite. This explains that bean seeds were more thoroughly mixed with oil and a thin film all over the seeds was formed in the tumbler application. This, perhaps, resulted in decreased % viable eggs (due to ovicidal activity of oils) and a decreased adult emergence.

Table 2 shows percentage bean seeds damaged by Mexican weevil following various oil treatments. Analysis of variance showed significant differences among the various oil treatments. Of the oils used, neem kernel oil was the most effective in controlling weevils and evidenced by least seed damage. Other oils had comparatively more seed damage one month after treatment. The % seed damage increased in all oil treatments two months following the treatment with the exception of neem kernel oil treated seeds which were still least damaged. The protective ability of the oils was neem kernel oil> palm oil > coconut oil > sunflower oil > cotton oil (in that order).

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YIELD LOSSES IN DRY BEAN (*Phaseolus vulgaris* L.) CAUSED BY ANGULAR LEAF SPOT (*Isariopsis griseola* Sacc.)

Carlos Agustin Rava Seijas, Aloísio Sartorato
and José Ruy Porto de Carvalho
National Research Center for Rice and Bean - CNPAF
Posthox 179 - 74000 Goiânia, GO - BRASIL

Angular leaf spot, incited by *Isariopsis griseola* Sacc., has become one of the most important diseases of dry beans in Brazil. In the past, it was considered to be a disease of minor importance due to its low incidence and late appearance in the growing season. However, these facts have changed and angular leaf spot has caused severe yield losses in some bean production areas. This study was conducted during 1981-83 at Centro Nacional de Pesquisa de Arroz e Feijão in order to assess yield losses in dry beans caused by this disease.

The experiment was a split plot in a randomized complete block design with five replications. Treatments (subplots) consisted of 9 cultivars (Jalo EEP 558, Caraota 260, Ricopardo 896, Black Mexican (Chile), CNF 0010, Cuva 168-N, Turrialba-1, Turrialba 4 and Rosinha G-2). Plots were either inoculated or kept disease free by fungicide treatment.

Abundant sporulation was achieved by growing the isolates of *I. griseola* on bean leaf-glucose-agar (300g bean leaves, 10g glucose, 18g bacto-agar and 1000ml distilled water). The inoculum consisted of a mixture of isolates. Plots were inoculated four times with a spore suspension of 2.0×10^4 conidia/ml. The control plots were kept disease free by five Benomyl (Benlate) sprays at a dosage of 200g a.i./ha. Treatments with inoculum or fungicide were applied on the same day at weekly intervals beginning 30 days after planting. Symptoms were evaluated 75 days after planting by assessing the percentage of leaf area affected (LAA) by the disease.

An analysis of variance for yield showed significant differences ($P = 0.0001$) between inoculated and controlled plots. For all 9 cultivars an average yield loss of 31% over 2 years, was obtained. Mean yield losses and leaf area affected are shown in Table 1. Although not significantly different from all cultivars, Jalo EEP 558 was the most resistant. A correlation of -0.89 ($P = 0.0001$) between percent leaf area affected and yield was obtained. The regression equation yield = 86.84 - 0.788 LAA indicates that for each 10% increase in disease there is a 7.88% reduction in yield.

TABLE 1. Mean leaf area affected and mean yield losses caused by angular leaf spot on nine bean cultivars.

Cultivars	Leaf area affected (%)*	Yield loss (%)*
Jalo EEP 558	2.58 a**	7.76 a**
Caraota 260	4.77 a	12.66 a
Ricopardo 896	8.31 a	19.79 ab
Cuva 168-N	23.87 b	29.58 abc
Black Mexican (Chile)	26.78 b	36.63 bc
Turrialba 4	28.40 b	38.87 bc
Turrialba 1	24.74 b	43.66 c
Rosinha G-2	44.30 c	45.41 c
CNF 0010	39.69 c	45.45 c
LSD	6.079	23.636

* Average over 2 years

** Means in the same column followed by the same letter do not differ by Tukey's test ($P = 0.05$).