

LOSS IN YIELD OF GROUNDNUTS AFFECTED BY GROUNDNUT MOSAIC VIRUS DISEASE

GEH SWEE LAN and TING WEN POH*

Accepted for publication: 18 Dec. 1972.

Ringkasan

Penyakit virus mosaik kacang tanah (groundnut mosaic virus) yang dijangkitkan ke pokok-pokok yang berumur 10 hari menyebabkan pengurangan yang lebih ke atas hasil-hasil kacang tersebut. Pokok yang dijangkitkan dengan penyakit ini dapat dibuktikan dengan hasilnya yang berkurangan dan biji-bijinya lebih kecil daripada pokok-pokok yang tidak dijangkitkan.

Percubaan di pasu-pasu dan di ladang-ladang membuktikan bahawa kenaikan peratus pokok-pokok yang dijangkit oleh penyakit ini boleh mengurangkan berat kacang, berat biji dan jumlah berat pokok-pokok kacang tanah.

Introduction

The importation of groundnut and its products into West Malaysia amounted to approximately 5.5 million dollars in 1970 (Statistical Digest, 1970). This clearly indicates that there is an internal market for groundnut which is not being filled by local production. Cultivation of this crop in West Malaysia is carried out mainly in small holdings but there is a growing interest in groundnut as an intercrop with immature rubber and oil palm. In early 1969, an oil palm estate in Sungai Buloh, Selangor, grew groundnuts (Spanish-type) on 20 acres interplanted with young oil palm. Extremely poor yields were obtained from this planting. The failure of this crop was found to be associated with an outbreak of groundnut mosaic virus (GMV) disease affecting nearly 100 % of the crop (Ting *et al.*, 1972).

Prior to 1969, there was no record of groundnut diseases causing severe reduction in yields in West Malaysia. However, in many other countries, virus diseases have been reported to affect the yield and quality of groundnuts. Infection of groundnut plants by rosette virus disease has resulted in crop losses (Line, 1926; Storey and Bottomley, 1928; Porteres and Legleu, 1937; Boriquet, 1939; Gohier, 1946; De Preter, 1947; Evans, 1951; De Berchoux, 1960; Kousalya *et al.*, 1967; Klessner, 1968). Stunt virus disease has also been known to reduce yield and quality of groundnuts (Troutman, 1966; Miller and Troutman, 1966; Culp and Troutman, 1967; Kuhn, 1969). Furthermore, there are numerous reports of yield losses being incurred through infection by (ot67) peanut mottle virus (Kuhn, 1965) 'marginal 1959; Vasudeva, 1960 and Chenulu *et al.*, 1969) other viruses: mosaic virus (Cheo and Tsai, 1961), chlorosis' virus (Van Velsen, 1961) and tomato spotted wilt virus (Helms *et al.*, 1961).

This paper reports on a study conducted to find the effect of GMV disease on the yield of groundnuts.

Materials and Methods

Groundnut seeds (Spanish type; Variety V 13) treated with Agrosan GN¹ (3 oz./100 lb) were sown in 6" x 4" polyethylene bags (1 seed per bag). When the plants were 10 days old, they were sap-inoculated as previously described (Ting *et al.*, 1972) prior to being transplanted randomly either into pots or in the field.

* Work carried out while authors were in the Department of Agriculture, Kuala Lumpur.

¹ Phenyl mercury acetate and ethyl mercury chloride

Four treatments were compared, comprising of the following :—

- 1). Control — all plants/plot not inoculated.
- 2) 25% of all plants/plot inoculated.
- 3) 50% of all plants/plot inoculated.
- 4) 75% of all plants/plot inoculated.

Pot experiment :

Four potted plants were used in each plot and these were laid down in a double 4 by 4 Latin Square design. The experiment was conducted in an insect-proof house in April, 1970. Harvesting was carried out 100 days after sowing and the dry pod weight, dry seed weight and number of pods per plant were recorded. Seeds were graded with wire mesh screen of various sizes: A, B, C.

- A : greater than 7.9 x 7.8 mm
- B : between 7.9 x 7.8 mm and 5.4 x 5.4 mm
- C : between 5.4 x 5.4 mm and 3.5 x 3.5 mm

Field experiment

The field experiment, similar in design to that of the pot experiment, was laid down on a sandy clay loam at Federal Experimental Station, Serdang, Selangor in April, 1970. Each plot consisted of 200 plants. Plot sizes were 10' x 10' with planting distances of 12" x 6".

Prior to planting, Lasso**, a pre-emergence herbicide, was applied twice to the field plots at a rate of 3 pints per acre. Fertiliser mixture was broadcasted before planting, at the rate of 30 lb N, 50 lb P₂ O₅, 50 lb K₂ O per acre in the form of Nitro 26, Triple Superphosphate and Muriate of Potash respectively. Manual weeding was done twice during the growing season.

The groundnuts were harvested 100—105 days after sowing and the pods removed by hand. Total fresh weight of plants (without pods) in each plot was recorded. Total dry weight values were obtained from total fresh weight of plants.

Weight of dried pods and dried seeds per treatment plot were also recorded.

Results and Discussion

Mosaic symptoms appeared on most of the sap-inoculated plants 5 days after inoculation. While the field experiment was in progress, the mosaic disease was observed spreading to the non-inoculated plants in both treated and control plots. Most of the spread appears to have been due to the vector, *Aphis craccivora* Koch which was found on abandoned groundnut plots in the experimental station. Some experiments conducted earlier have indicated that slight contamination could have occurred in the process of inoculation.

Analysis of the results from pot and field experiments showed that the treatments were significant at the 1% level. A summarised analysis of variance table is presented in Table I for one variable.

** 2-chloro-2', 6'-diethyl-N (methoxy-methyl) acetanilide

TABLE 1
Wt. of dried pods, gms per plot

	DF.	M.S.	F — Value
Treatments	(3)	109,778	5.10*
Linear Effect	1	316,244	14.69**
Deviations	2	6,646	N. S.
Error	15	21,526	

The pot trial showed that an increase in the percentage of infected plants resulted in a marked decrease in weight of dried pods, weight of dried seeds, and number of pods per plant (Fig. 1). In the field trial, an increase in the percentage of infected plants resulted in a significant drop in yield in terms of weight of dried pods, weight of dried seeds and total plant weight per plot (Fig. 2). In the absence of GMV infection (Fig. 1) a yield of 11.5 pods/plant was obtained in the control plots, but the extrapolated yield at 100% infection would be 6.5 pods/plant — a yield reduction of 43.5%. Graded seeds from the pot experiment showed that healthy control plants yielded 1651 seeds of which 60.9% were grade A; 28.04% grade B and 11.08% grade C. This is in contrast to the diseased plants which gave 404 seeds comprising 42.08% grade A, 38.37% grade B and 19.55% grade C. The above data clearly indicated a reduction in number and size of seeds as a result of GMV infection.

The findings of this study agree with that obtained in the 20 acre field of nearly 100% virus-infected groundnuts in Sungai Buloh, Selangor (Ting *et al.*, 1972). Assessment of the yield based on 170 infected plants randomly collected from the Sungai Buloh field showed a very low pod production of 3 fully formed pods per plant. Evidently the cause of the severe crop loss was due to the infection of GMV disease.

Our studies have shown that infection of 10 day-old plants by GMV can result in considerable reduction of pod weight, seed weight, seed size, pod number and the total plant weight of groundnuts. A 50% infection at 10 days results in a loss of approximately 15% yield of dried seeds on a unit area basis.

Acknowledgements

The authors wish to thank Mr. Lee Chong Soon, Biometrician, for his help in the statistical analyses and Mr. Chan Seak Khen, Agronomist, for his advice and assistance.

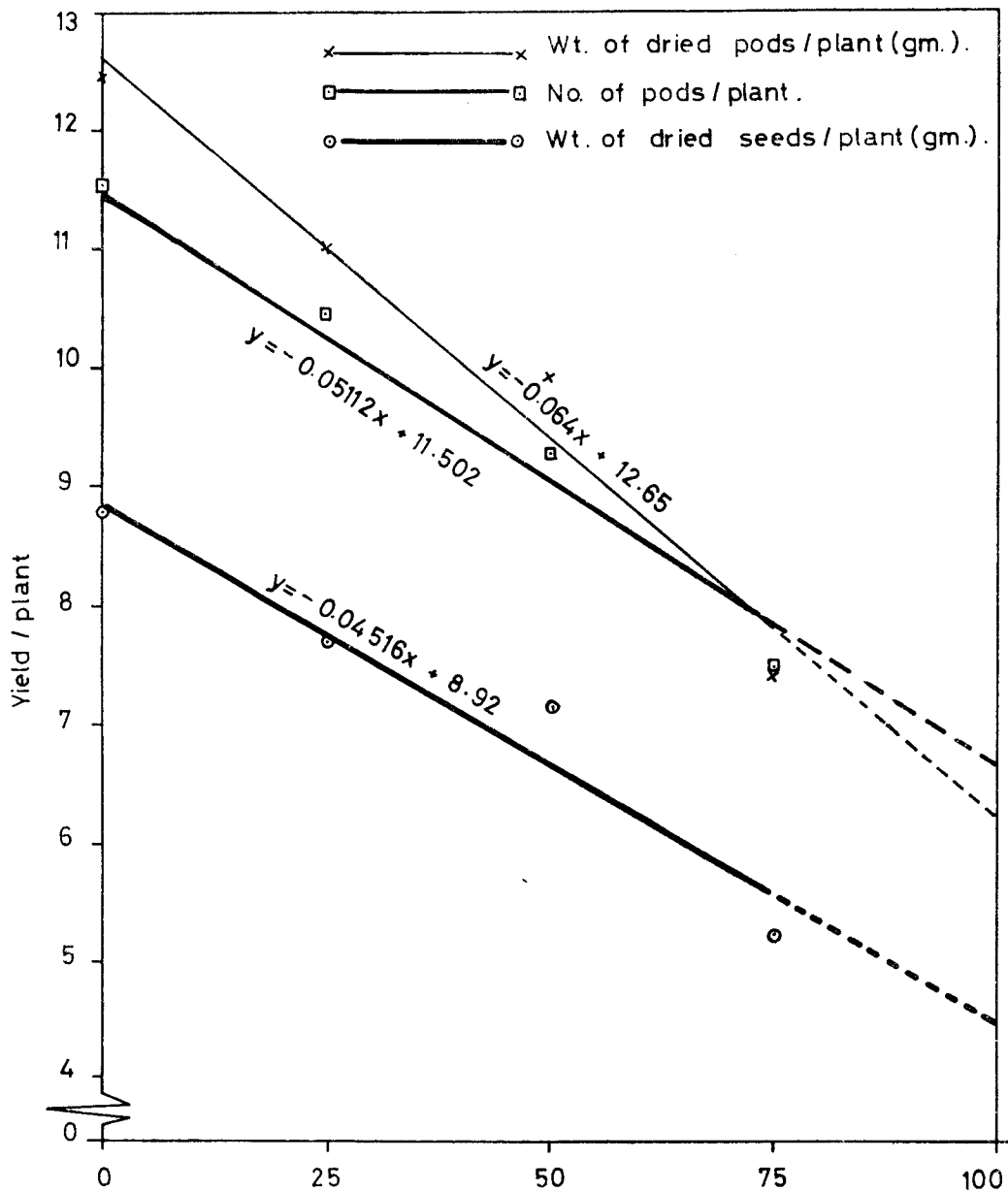
Summary

Groundnut mosaic virus (GMV) infection of 10-day-old groundnut plants brought about considerable reduction in the yield. Virus-infected plants were shown to produce fewer pods and smaller seeds compared to non-infected plants. Both pot and field trials also showed that an increase in the percentage of infected plants can result in a significant decrease in pod weight, seed weight and total plant weight of groundnuts.

* Significance at 5% level

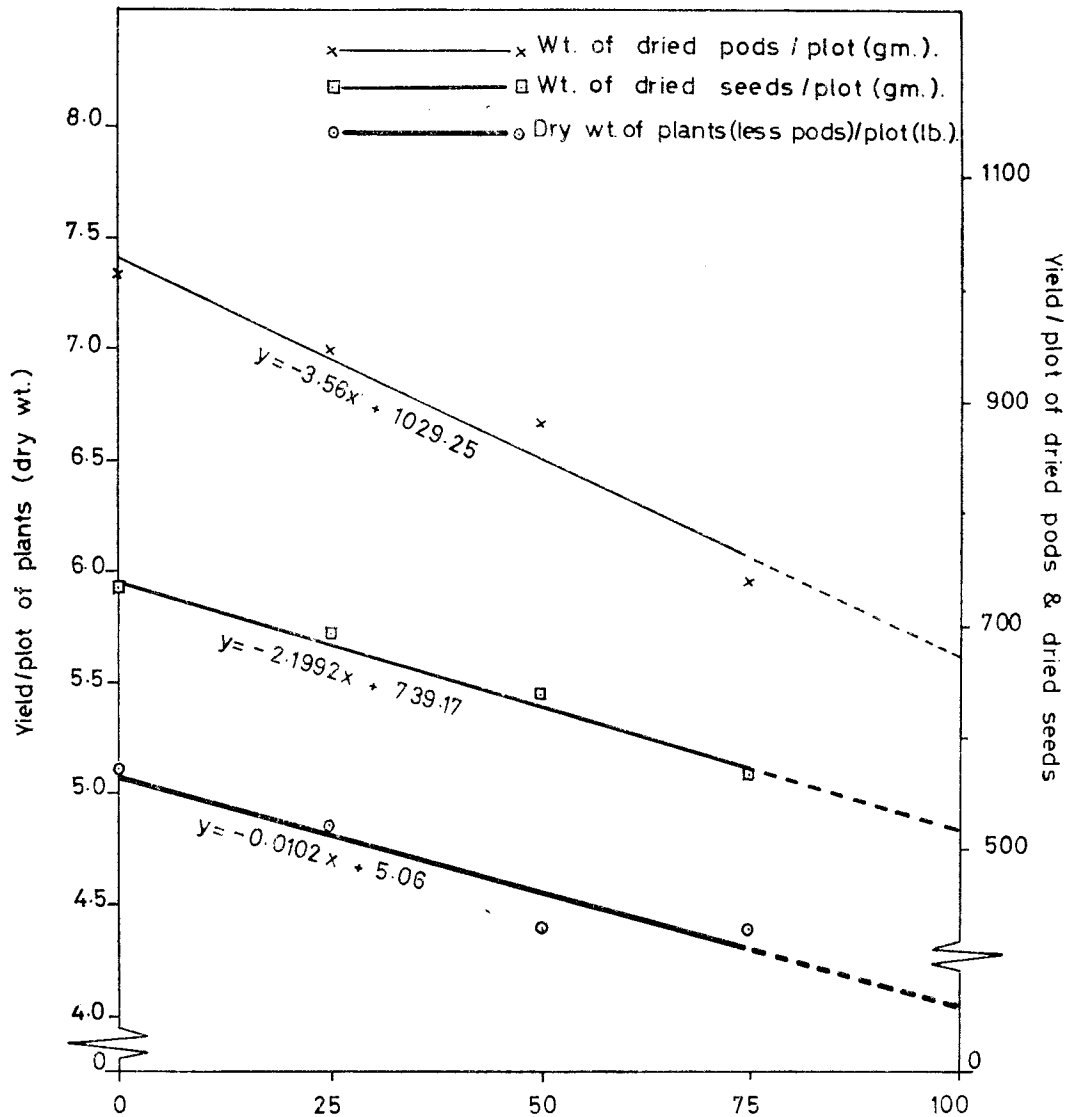
** Significance at 1% level

Figure 1



RELATION BETWEEN PERCENTAGE INFECTION AND YIELD PER PLANT (POT EXPERIMENT)

Figure 2



RELATION BETWEEN PERCENTAGE INFECTION AND YIELD PER PLANT
(FIELD EXPERIMENT)

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