https://doi.org/10.29321/MAJ.10.A04163

Manuring Crops

by
Dr. A. MARIAKULANDAI
Agricultural Research Institute, Coimbatore

(Contd. from July 1957 issue)

[Abstract of the Curzon Lectures]

Sugarcane: Manurial experiments have been conducted during the past four decades on sugarcane in Madras State primarily in the Research Stations at Gudiyattam in North Arcot District and Palur in South Arcot District.

Palur: Comparison of the effect of organic and inorganic nitrogen, alone and in combination was made at the following levels, namely,

(1) Ammonium sulphate at 75 lb. N and 150 lb. N.,

(2) Groundnut cake at 75 lb. N and 150 lb. N.,

(3) 75 lb. N – half as groundnut cake and half as ammonium sulphate.,

(4) 150 lb. N. half as groundnut cake and half as ammonium sulphate.

It was found that 150 lb. N when applied half as groundnut cake and half as ammonium sulphate was the best. A combined manurial and varietal trial at the same station revealed that,

(a) Co. 419 with 75 N gave as good yields as Co. 349 with 150 N.

(b) Co. 419 is capable of thriving even with less doses of N.

(c) Higher dosages of N have not affected the sucrose content.

(d) P_2O_5 and K_2O either alone or in combination did not influence the yield or quality of cane. Other experiments have shown that a mixture of groundnut cake and ammonium sulphate in the ratio of 3 : 1 is the best.

Optimum nitrogen dose trial: The experiment was conducted with graded levels of groundnut cake with and without cattle manure and the effect on quality of jaggery and yield was noted. The results indicated no significant differences in yields, between cattle manure and no cattle manure series, but there was regular increase in the tonnage of cane with increase in N level up to the maximum

dose of 250 lb. N per acre. In respect of both the varieties tried, there was no difference in the quality of juice by the application of cattle manure. The highest sucrose content and purity were obtained in the plots manured with 100 lb. N. The higher doses of N reduced slightly the sucrose content in the juice and its coefficient of purity. When the economics of the manurial treatments were considered, it was observed that with the increase in the dose of N upto 250 lb., there was increased net income. As a substantial increase in the yield of cane occurred even at the highest dose of nitrogen, viz. 250 lb. per acre, the point at which further addition of N does not result in increased yields could not be determined in this trial.

To assess the optimum dose of N at the Agricultural Research Station, Gudiyatham, six levels of nitrogen per acre as groundnut cake over a basal dressing of 10 tons of cattle manure were tried with Co. 419 variety. There was good response to nitrogenous manuring upto 200 lb. nitrogen per acre. The yields of plots which did not receive oil cake were very poor, though the plots had received cattle manure as basal dressing. Sugarcane therefore requires adequate concentrated nitrogenous manure like oil cakes upto 200 lb. of nitrogen per acre to give optimum yields according to this trial.

In a set of trials with a mixture of ammonium sulphate and groundnut cake and chilean nitrate to ascertain the influence of the form of N, chilean nitrate fared better both from the point of cane yield and sucrose content per acre. No difference was, however, noticeable either in cane yield or quality when N was supplied in different forms like ammonium sulphate, groundnut cake,, castor cake, mixture of groundnut cake and ammonium sulphate, and a mixture of castor cake, and ammonium sulphate. The application of basal dressings like farm yard manure, farm yard manure plus sunnhemp (intersown) or superphosphate did not make any difference. Earlier trials showed that a mixture of groundnut cake and ammonium sulphate (in the proportions of 2 : 1 N) was suitable for this tract.

Effect of phosphatic manures : Applications of superphosphate at one cwt. per acre did not have any beneficial effect on the quality of juice or on the yield.

Effect of manuring at the time of planting on germination of Sugarcane : To study the effect of concentrated manures on the germination of sugarcane when applied at the time of planting,

50 lb. N as castor cake or as sulphate of ammonia or as a mixture of both in the proportion of 2/3 castor cake to 1/3 as ammonium sulphate was applied to the variety Co. 419. The results of three years trials indicated that the application of concentrated manures at the time of planting had no adverse effect on the germination of the cane.

Cotton : Manurial experiments on cotton have been done in the erstwhile Madras State in tha Agricultural Research Stations at Koilpatti (Black soil), Coimbatore (Mixed Black and Red Soil — irrigated), Hagari (Black cotton soil), Bellary (Black cotton soil) and Guntur (Black cotton soil). In general, cotton is rotated with some cereal, cumbu or sorghum being most common. The Experiments upto 1930 gave the following results.

Kovilpatti : (Black soil) — Groundnut cake at 500 lb. per acre plus super phosphate at 112 lb. or ammonium sulphate 224 lb. plus super phosphate at 112 lb. gave 38% increase over "no manure" with no difference between themselves. Residual effects on cumbu and cholam were also significant. The same manures applied to the cereal and residually to cotton also produced significant results in a 12% increase. Prickly pear compost had no effect.

Coimbatore : (Cotton Breeding Station) (Black soil) — Basal cattle manure or compost with a top dressing of ammonium sulphate at 30 lb. N per acre alone or in combinatiom with super phosphate at 40 lb. P_2O_5 and potasium sulphate at 25 lb. K_2O per acre gave higher yields than "no manure". Green manure (sunnhemp) gave 19% increase over "no manure" and also cattle manure at 12 cartloads per acre. Ammonium suphate at 448 lb. plus super phosphate at 224 lb. per acre applied to sorghum had no residual effect on succeeding cotton crop. In general therefore, without a basal dressing of cattle manure, cotton was not benefitted directly or residually by artificials.

Hagari : (Black cotton soil) — Ammonium sulphate or cyanamide at 224 lb. per acre and super phosphate 112 lb. per acre applied to sorghum had residual effect on cotton. Ammonium sulphate at 20 lb. N per acre or sodium nitrate at 20 pounds N per acre applied to cotton depressed the yield.

Bellary : (Black cotton soil) — Safflower cake at 100 lb. per acre alone or combined with super phosphate at 300 lb. per acre or sodium nitrate at 300 lb. per acre or combined with basic slag at

300 lb. per acre depressed the yields. Cake at 1000 lb. per acre, sodium nitrate at 300 lb. per acre or super phosphate at 300 lb. per acre had no residnal effect on cotton.

Guntur (Black cotton soil) : Ammonium sulphate at 224 lb. per acre plus superphosphate at 112 lb. per acre applied to sorghum had no residual effect on cotton. Cattle manure plus ammonium sulphate was not better than cattle manure alone.

Subsequent experiments between 1930 and 1940 revealed the following :

Irrigated Cotton : In Coimbatore, continued application of bulky organic manures, viz. cattle manure and green manure increased the yield during a three year experiment. Cattle manure gave an increase of 22% over control while green manure ploughed in situ yielded 16% over control. In another experiment to test the relative effects of artificials, viz. Ammonium sulphate (60 lb. N) alone, and in combination with potassium sulphate (40 lb. K_2O) and super phosphate (80 lb. P_2O_5), favourable results in two out of the three years have been obtained, with N + P and N + K + P, the increase being 40 and 34% respectively over an average yield of 560 lb. kapas. In the presence of cattle manure applied regularly over a number of years, the response for the various combinations of artificials is not significant. Cotton was grown in a year in the New Permanent Manurials at Coimbatore. Cattle manure alone at 5 tons gave 31% over control while N + K + P (at one cwt. each of ammonium sulphate, potassium sulphate and 3 cwt. of super phosphate) gave only 10% over the control yield of 1200 lb. Basal dressing with cattle manure gave an uniform 15% increase in all the treatments in the New Permanent Manurial plots.

Dry Cotton : Manuring of cotton grown under dry conditions has not been practised much because of its doubtful value. In the Old Permanent Manurial plots at Coimbatore, plots treated with cattle manure, direct and residual, N + K + P and N + P gave 136, 164, 75 and 201% respectively over the control (no manure) yield of 161 lb. Kapas per acre. In Guntur, Nandyal and Hagari no consistent or reliable result in favour of artificials could be obtained in 3 years of experiment by manuring with ammonium sulphate (2 cwt.) plus superphosphate (1 cwt.) with and without a basal dressing of 5 cartloads of cattle manure. In favourable years of rainfall however, 19 and 25% increases have been recorded in Guntur for

fertilisers applied in combination with cattle manure. 16% over control yield of 258 lb. was similarly obtained in Nandyal when artificials were applied in combination with cattle manure. In the year of application of cattle manure its effect is not at all felt except in combination with artificials. But residual effects of the manures applied to the previous cereals have been reported.

In Nandyal, cattle manure (5 cartloads per acre) and artificials (Ammonium sulphate 2 cwt. and super phosphate 1 cwt.) applied individually and in combination to sorghum gave residual effect on the succeding cotton crop and gave an increased yield of 12, 26 and 38% respectively over control yield of 223 lb. kapas per acre. In another set of experiments, cotton manured similarly was followed by sorghum and succeeding cotton crop and the corresponding increases were 11, 7 and 20% respectively over no manure plots. Similarly at Hagari, artificials applied to cholam crop showed residual effects on the succeeding cotton crop, in two out of the three years with 38% increase over control (202 lb. kapas). The residual value of composts and farm yard manure applied at 50 lb. levels of N to previous crop of Tenai has increased the yields of the succeeding cotton by 2 and 11% respectively. When sorghum was the previous manured crop, the corresponding increases were 36 and 32% with no significant difference between the two manures.

In Kovilpatti, intensive studies have been carried out on the response of cotton to manures of different types. Ammonium sulphate at 2 cwt. per acre in split doses of one, two and three instalments at varying levels did not produce any significant difference. All of them increased the yield, the increases being of the order of 20 to 25% over no manure (560 lb. kapas.) Cotton kapas yield was increased by 30% by applying 1 cwt. super phosphate plus ammonium sulphate at 2 cwt. or groundnut cake at 250 lb. with 1 cwt. ammonium sulphate over a basal dressing of 6 cart loads of cattle manure while only 17% increase was recorded with only 1 cwt. of ammonium sulphate *or* 500 lb. of groundnut cake *or* 125 lb. groundnut cake with 56 lb. ammonium sulphate. The direct application of molasses at about 5 tons per acre in one year has given an increase of 46% over control.

Increase over control of 15 to 30% (700 lb. kapas) has been observed in experiments conducted to test the residual effects of ammonium sulphate at 2 cwt. per acre or groundnut cake at 500 lb. per acre applied to the previous cereal crop

of cumbu or sorghum over a basal dressing of 4 cartloads of cattle manure, 2 cartloads of cotton compost plus 1 cwt. of super. In the case of residual effect of the manures on cotton in second year, after cotton and cumbu or cotton and sorghum, 9 to 10% increases over control have been reported. Based on the experimental results in the various farms in the state, the general recommendations are (i) 20 lb. N. as ammonium sulphate for rainfed karunganni which may be increased to 40 lb. in Tirunelveli tract (ii) 40 lb. N. as ammonium sulphate for irrigated cambodia which may be increased to 60 lb. in Coimbatore tract. This may be supplied in two doses, namely prior to sowing and at flowering time.

Response of cotton for major nutrients: Some experiments have been done under the Free Fertiliser Domonstration Scheme by the I. C. A. R. in 1954—55 in Pepsu, Punjab and Rajasthan and the responses obtained in their experiments along with the average responses obtained in the Madras State Manurial Experiments are presented in Appendix (of next issue). For dry cotton, State experiments have given 3 to 6 lb. cotton kapas per lb. of N in the inorganic form and 3 to 18 lb. kapas per lb. of N in the organic form. The trials done outside the State have given 0·6 to 1·2 lb. kapas per lb. of inorganic nitrogen and 1·4 lb. kapas per lb. of organic nitrogen.

In the case of irrigated cotton, State Permanent Manurial experiments gave 2 to 3·5 lb. of kapas per lb. of N in the inorganic form and 9 to 39 lb. when organic form of N was supplied.

The Free Fertiliser Demonstration trials done outside the State revealed a response of 2·2 lb, of kapas per lb. of nitrogen.

The response to phosphorus or potash had been low and uneconomical in all trials.

[to be continued]