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Preliminary studies on the influence of depth of placement of potato seed on yield

by

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Introduction : For cultivated crops, the depth at which the seed material is placed in the soil has an important bearing on growth and ultimate yield. While placement of the seed at a depth desirable to ensure optimum germination varies from crop to crop, it is also influenced by various factors such as the size of seed and its viability, the physical nature of the soil, the slope of the terrain and the extent of rains received after sowing. Very small-sized seeds would require only a thin layer of soil as cover and, if sown deeper, may result in low germination and loss of stand. At the same time, the soil cover, while admitting easy emergence of the plumule on germination, should be good enough to protect the germinating seed from direct rays of the hot sun or the beating effect of sharp showers. Correct depth of sowing is that one which ensures the optimum soil-cover for seed against climatic factors, and facilitates easy germination and firm anchorage for the developing young plants.

In potato particularly, the placement of seed assumes special significance. Being a soft tuber with a thin skin and sensitive 'eyes', if placed very near the surface soil, the tuber tends to 'greening' and 'sun-burn' due to exposure to sun-light, and may also be easily picked up and eaten by rodents. In addition, the eyes that are not in direct contact with soil may fail to sprout and develop. Since the crop is cultivated on steep slopes, a sudden burst of rain, which is not uncommon in the region, may carry away the top tubers, resulting in loss. Normally, the tuber takes a long period of nearly three weeks to emerge out of the soil, and therefore, the depth of planting should be such as to offer the maximum guarantee against loss by the factors mentioned above.

The ryots in the Nilgiris, generally plant the seed tubers at a depth of about four inches in the furrows made with the '*gudali*', a local digging implement like pickaxe. At the Agricultural Research Station, Nanjanad, where bullock-drawn ridging implements are in use, the average depth of planting varies between six and eight inches.

Review of literature : In Florida, one of the important potato-growing centres of the U. S. A., the practice is to plant the seed tubers at one to two inches below the soil surface. Fifield (1), in his

studies in Florida region, concluded that depth of planting had no relation to yield and that there was the probablity of securing higher yields from such shallow plantings in years of adequate soil moisture than during dry periods, while Hardenberg (2) recorded increased yields and less sun burn by adopting a depth of three to four inches in light soils. Lorenz (3), secured higher total yields with four to six inches depth than with nine inches; while the total yields from the two-inch planted plots were only slightly lower than those from the plots planted four to six inches deep, the return of 'ware' (marketable produce) was much less in the former, due to greater sun-burn. Moore (4), working on problems relating to soil and plant response to cultivation methods for potato, found, that deep planting speeded the rate of come-up, which he ascribed to the greater and better distribution of soil moisture in the lower layers.

Materials and methods: In the absence of any definite data on the optimum depth for planting potato, and to prescribe the best one suited to soil and weather conditions obtaining locally, preliminary trials were conducted at the Agricultural Research Station, Nanjanad, during two crop seasons, in the years 1949 and 1950. The soil on which potato is raised in the Nilgiris, is sandy red loam, highly acid (PH. 4.6) and poor in organic matter. The different treatments for depth consisted of four levels viz., two inches, four inches, six inches and eight inches in the second crop season of 1949, and five levels viz., ground level, two inches, four inches, six inches and eight inches in the main crop season, 1950. While for the former trials (1949), only the yield figures were taken into account, in the main crop season (1950), detailed records of crop-growth, such as the sprouting percentage, the mean height, number of tillers and sun burnt tubers, for the different treatments were noted. The size of each plot was an eighth of a cent and each treatment was replicated four times. The data are presented in the following table.

TABLE I. (Second crop, 1949).

Summary of results.

Treatments	Depth of planting 2" (A)	4" (B)	6" (C)	8" (D)	G.M.,	S.E.,	Z. Test.	CD(P=0·05)
Acre yield in lbs.,	3000	3500	3700	4400	3650	358	Satisfied.	814
Percentage on general mean.	82·2	95·8	101·3	120·5	100·0	9·8		22·3

Conclusion: D, C, B, A.

TABLE II. (Maincrop, 1950).

Treatments	Depth of planting G.L. (A)	2″ (B)	4″ (C)	6″ (D)	8″ (E)	G.M.,	S.E.,	Z.Test.	CD(P=0·05)
Acre yield in lbs.,	6800	7000	9600	11600	7000	8400	1201	Satisfied	2612
Percentage on general mean.	80·9	83·3	114·3	138·1	83.3	100·0	14·3		31·2

Conclusion: D, C, B, E, A

TABLE III. (Main crop 1950).

Depth of planting	Percentage of sprouting	Mean height in inches per plant	Mean No. of tillers per plant	Mean No. of sun burnt tubers per plot.
A. Ground level	92·1	6·4	2·1	86
B. 2″	86·7	6·7	1·9	76
C. 4″	95·3	6·6	2·2	44
D. 6″	94·5	6·9	2·0	37
E. 8″	84·3	6·6	2·0	37

Discussion: During the second crop season of 1949, the yields of plots, sown at the depths of six inches and eight inches were better than those from the plots planted nearer the surface, while for the main crop season of 1950, the six inches depth treatment was the best. There was practically no difference for sprouting percentage between four-inch and six-inch depths. Vigour of growth, as reflected by mean plant height, was the maximum for six-inch depth of planting. While rate of tillering exibited no striking differences among the five treatments, 'sun-burn' was, definitely the least, for six inch and eight inch depths, showing a steady progressive increase for the treatments nearer the soil surface.

The rolling terrain and the sharp slopes over which potato is cultivated in the hills necessitate the use of implements in such a way as to involve the least strain on the animals. Ploughing to greater depths without proportionate increase in yields would only mean so much waste of labour. Again, the soils are generally shallow, overlying a bed of laterite at a depth of a foot or slightly more. Deep working of such a soil may result in loss of the fine top-soil in course of years, as a result of erosion by wind and rain.

The results of the preliminary trials indicate that a depth of six to eight inches is optimum for planting the potato seed tuber. Ploughing to a depth of about six inches is fairly easy with cattle, and the uneven level of the land makes deeper field operations also difficult. At the same time, placing the seed too near the surface is not desirable, as it may expose the developing tubers to attack by tuber moth, as has been recorded by others. Further, the common weeds of the region like Spurry and Poligonums are all surface rooted and therefore, even intercultivation for weeding need not be deep.

Summary: Under Nilgiri conditions, taking into account, the aspects of ease of cultivation crop growth, minimum injury by 'sun-burn' and tuber moth attack and ultimate yield, a safe rule would be to plant the potato seed tuber at a depth of about six inches below the soil surface.

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