

Crop Rotation Studies on Potatoes

by

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No systematic or definite crop rotation is practised by potato growers on the Nilgiris. In pre-war years, when the area under potatoes was limited, only one potato crop used to be taken from the same land once in three or four years. During wartime, increased demand resulted in soaring prices and an extension of the cultivated area, and it was a common sight to come across the same land growing potatoes every year. The present practice, however, is a two-year rotation, consisting of a crop of potatoes in the first year, followed by a grain crop like *samai*, barley, wheat or *ragi* in the second year.

In the United Kingdom, potatoes are chiefly grown either after a grain crop, usually oats, or alternated with a mixed crop of forage grasses and clovers. In districts growing early potatoes, where suitable soil and other conditions are limited for growing other crops, two or more potato crops are however grown in succession. It is on record that on some fields, potatoes have been successively grown for 30, 40 or even more years. Such intensive cropping is not desirable, since there is always the risk of encouraging serious pests of potato like eelworms and diseases like Powdery Scab or Wart disease.

The practice in America is to grow potatoes followed by corn, barley or lucerne in two-year rotations, but here too, the temptation to grow a money crop like potato, as often as possible, is very great. There have been instances of the same land from which two potato crops had been annually removed for as long and continuous a period as 33 years.

Information on crop rotation studies on potato done in other countries, is mainly limited to investigations on the effects of continuous cropping of potatoes on the incidence of pests and diseases. Melhus, *et al*, (2) had obtained evidence of persistence of Powdery Scab organism in the soil even after a five-year interval between two potato crops. Scab control by a judicious rotation of potato varieties, including the resistant variety, *Jubel*, was recommended by Miss de Bruyn (1), if intensive cultivation of potatoes was necessary. Increasing the rotation between successive potato crops to six or seven years to control Common Scab has been suggested by Whitehead, *et al*, (4).

According to Thomas and Eyre (3), after the potatoes have been grown on the same land for ten to twelve years, it would be advisable to lay the field down to grass for two or three years and to graze it as much as possible thereby ensuring that trace elements, that might have been removed by the potatoes, are replenished. Citing the benefits of growing green manure crops like mustard, rape, ryegrass, clover, lupins and vetches, they have stated that such a practice was healthy, since it led to improvement in the organic matter content of the soil, the utilisation of nitrogen and other soluble plant foods left after lifting of potatoes and prevention of development of weeds. The relative values of the different rotational crops are not, however, specified.

In the absence of any local information available on the benefits of crop rotations for potato, studies were undertaken over a period of six years, commencing from 1942, and the results are reported in this paper.

A total of 17 rotational treatments was adopted to include various cereals and also lupins for green manure. Four different cereals, viz., barley, oats, *Samai* and *Korali* were used. The details of treatments are presented in the accompanying table:

DETAILS OF TREATMENTS.

Treatment symbol	First two-year rotation		Second two-year rotation		Third two-year rotation	
	April 1942	Sept. 1943	April 1944	Sept. 1945	April 1946	Sept. 1947
A	P	P	P	P		
B	P	F	P	F		
C	P	F	S	F		
D	P	F	K	F		
E	P	F	B	F		
F	P	F	O	F		
G	P	L	P	L		
H	P	L	S	F		
I	P	L	K	F		
J	P	L	B	F		
K	P	L	O	F		
L	S	F	P	L		
M	K	F	P	L		
N	B	F	P	L		
O	O	F	P	L		
P	S	F	P	F		
Q	K	F	P	F		
R	B	F	P	F		
S	O	F	P	F		

B = Barley.

F = Fallow.

K = *Korali* (*Setaria pallidifusca*, Stapf and Hubbard)

L = Lupin.

P = Potato.

O = Oats.

S = *Samai* (*Panicum miliare*, Lam.) Little millet.

Each of the three two-year periods, viz., 1942-'43, 1944-'45 and 1945-'46, was taken as a unit of rotation, and the results of the three units examined statistically as a serial experiment, were significant for (1) seasons and (2) treatments, and for all the three interactions, viz., (1) blocks \times seasons, (2) blocks \times treatments and (3) seasons \times treatments, as per the values extracted below :

Due to	C. D. (P = 0.05)	
	Observed	Calculated
1. Blocks	21.28	2.27
2. Seasons	16.51	3.06
3. Treatments	76.77	1.82
4. Interaction: Blocks \times seasons	11.36	2.00
5. " : " \times treatments	2.59	1.59
6. " : Seasons \times	3.74	1.59

An extract of the statistical examination of the combined yield values for all the three-year periods of rotation is given below :

Treatments	Acre yield of potatoes in lb.	Percentage of yield on control = 100 (H)
A	32,294	256.1
B	23,861	189.3
C	12,267	97.3
D	12,050	95.6
E	12,061	95.6
F	12,111	96.1
G	27,044	214.5
H	12,606	100.0
I	12,533	99.4
J	14,133	112.1
K	11,050	87.7
L	16,166	128.2
M	16,367	129.0
N	16,061	127.4
O	15,011	119.1
P	15,422	122.3
Q	15,306	121.4
R	15,733	124.8
S	15,944	126.5

Significant.

S. E. = 9.02.

C. D. (P = 0.05) = 1,782.

Conclusion: A, G, B, M, L, N, S, R, P, Q, O, J, H, I, C, F, E, D, K.

The conclusions are summarised below

(1) Growing potato after potato, every year, twice in the same year, gave the maximum total yield, though steady and gradual reduction of yields in the years succeeding the first, and increase of pests and diseases were evident;

(2) Raising a green manure crop of lupins, in the second season (September) every year, maintained the optimum yield of potato, every year, in five out of the six years; it was also noted that raising of the green manure crop, instead of leaving the land fallow after potatoes, resulted in increased potato yields

(3) While potato following cereals gave reduced yields, raising a green manure crop of lupins after potato (but not after cereals), restored optimum potato yields; and

(4) Of the various cereals tried, oats reduced the yield of the following potato crop to the maximum.

The results of the above crop rotation studies on potato, conducted during the six crop years, 1942—'47, have been summarised from the related Madras Agricultural Station Reports and represent the valuable work done on the subject by the staff of the Agricultural Research Station, Nanjanad, during the period. This is duly acknowledged by the authors in the preparation of this paper.

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