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Comparison of Production Efficiency, Land Use Efficiency, Migration Co-efficient in a Spice Based Cropping Sequence

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Abstract

Different spice based cropping sequences like garlic-mint-coriander (Leaf) (T_1), black cumin-ginger (T_2), fenugreek-Turmeric (T_3), coriander-ginger (T_4), capsicum-chilli (T_5), onion (seed)–turmeric (T_6), garlic-chilli (T_7), Coriander-mint-coriander (leaf) (T_8) were evaluated in the genetic alluvial soils of West Bengal. Analysis of component matrix and other principal components and regression factors indicate that the corps used in T_5 sequence followed by T_7, T_1 and T_8 sequence were promising combinations both from economical and soil health aspects.

Key words : Spice based cropping sequence, Production efficiency, Land use, Migration coefficient.

Spices have a significant role in the emerging scenario of the present day food industry due to peoples demand of ready to eat food and speciality cuisine. India enjoys a pre-eminent position in spice production and trade and well known as "Home of spices". Spices can advantageously be grown by the farmers as land demand for growing such spices will be minimum. The land resources of the country are limited (0.12 ha per capita) and it is expected to further decrease by the turn of this century due to ever increasing in population. So for efficient land utilization, we should follow different spice based cropping sequence to increase spice based cropping sequence to increase spice production per unit area of land and time. The demand for spices both in domestic and foreign markets are increasing day by day. Therefore, any judicious planning of cropping sequence with spice crop may be a boon particularly to the small and marginal farmers with minimum land holdings. Growing of organic spices may also be emphasized. The present investigation therefore was undertaken with the objective to study different spice based cropping sequences like T_1 Garlic-mint-coriander (leaf); T_2 Black cumin-ginger ; T_3- Femugreek-lurmeric; T_4 - Coriander-ginger : T_5 - Capsicum-Chilli; T_6 -Onion (seed) - turmeric; T_7 -Garlic-chilli and T_8 - Coriander-mint-Coriander (leaf) with emphasis on economic and soil health consideration. Principal component analysis (PCA) was followed to compare the performance of various sequence of spice crops on the basis of production efficiency (PE), land use efficiency (LUE), migration co-efficient (MC), benefit : cost ratio, pH, organic carbon (OC), available nitrogen (N), available phosphorus (P_2O_5), available potassium (K_2O).

Methods

PCA is a statistical method that enables the reduction of the large number of variable to a smaller, more coherent set of variable (1). PCA is useful for reducing highly correlated observation to a few prin-

Table 1. Component matrix and other PCA results.

Variables	Component 1	2	3
Production efficiency	0.04	0.71	0.70
Land use efficiency	–0.79	–0.26	0.12
Migration co-efficient	0.98	0.11	0.02
Benefit : cost ratio	0.93	0.30	0.11
pH	0.84	–0.11	0.34
Organic carbon	0.67	–0.71	0.20
Nitrogen	0.79	–0.58	0.01
Phosphorus	0.44	0.19	–0.48
Potassium	0.63	0.52	–0.42
Eigen value	4.82	1.82	1.08
Percentage of variance	53.54	20.18	11.97
Cumulative percentage	53.54	73.72	85.69

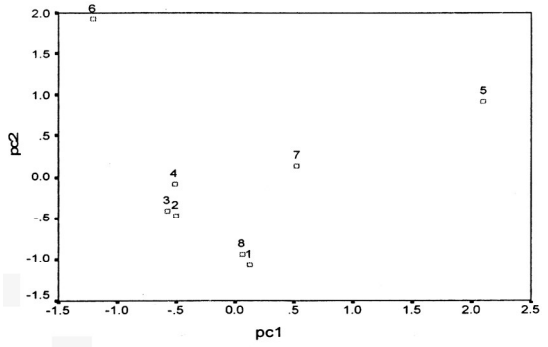

Figure 1. Scatter diagram of regression factor scores under first two principal components to show the relative positions of sequences of spice crops. 1. Garlic— mint–coriander (leaf), 2. Black cumin–ginger, 3. Fenugreek –turmeric, 4. Coriander – ginger, 5. Capsicum–chilli, 6.Onion (seed) – turmeric, 7. Garlic — chilli, 8. Coriander—mint— coriander (leaf).

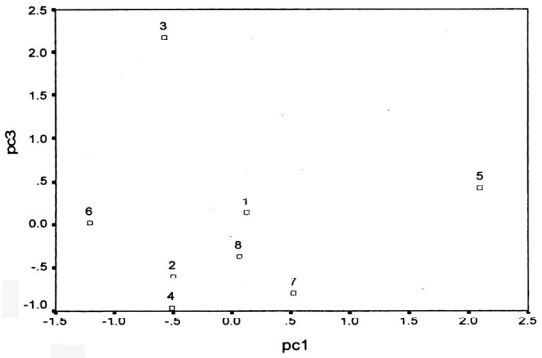

Figure 2. Scatter diagram of regression factor scores under first and third principal components to show the relative positions of sequences of spice crops. 1. Garlic–mint–coriander (leaf), 2. Black cumin–ginger, 3. Fenugreek –turmeric, 4. Coriander –ginger, 5. Capsicum–chilli, 6. Onion (seed) – turmeric, 7. Garlic—Chilli, 8. Coriander–mint–coriander (leaf).

cipal descriptors or factors. A component matrix of the variables is generated based upon correlation matrix eigen values and variables with high factor loadings best represent system attributes. Regression factors scores were calculated on the basis of factor loadings for each variables as described in component matrix. It is a method for estimating factor score co-efficients. The scores produced had mean of 0 and a variance equal to the squared multiple be correlated even when factors are orthogonal. Such factor scores were used to draw a scatter diagram to clearly understand the relative position of the sequences in a two dimensional form. Complete statistical analysis was done following SPSS (var 7.5) on a desktop PC (2).

Results and Discussion

Table 1 shows the principal component analysis (PCA) results where component matrix showed that factor 1 which explained 53.54% of total variance and variables like migration coefficient, benefit : cost ratio, pH, organic carbon, available nitrogen, phosphorus and potassium were highly positively loaded in this factor against the highly negatively loaded variable land use efficiency (LUE) as a contract. Factor 2 explained 20.18% of total variance and positively loaded with production efficiency, benefit : cost ratio and available potassium in contrast to land use efficiency, pH, organic carbon and available nitrogen. Again factor 3 explained another 11.97% of total variance and positively loaded with production efficiency, organic carbon, pH, land use efficiency and benefit : cost ratio in contrast to available phosphorus and potassium. These three factors (principal components) altogether explained about 86% of total accounted for variance of the whole study. Regression factor scores have been displayed at the scatter diagram (Figs. 1 and 2). These figures indicated that the crops used in T_5 sequence followed by T_7, T_1 and T_8 sequence were promising combination both from the economical and soil health aspects. Also the crop combination of T_6 and T_3 sequence only maximized the production efficiency but could not improve much of soil health.

References

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