

The Relationship Between Soil Colour and Certain Physical Properties in Profile Samples from Thimmapuram

by

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Introduction: The three colour attributes hue, chroma and value have been known to be related to certain soil properties. Relationship, if any, between colour and other properties could be established, it will be possible to infer the quality of the soil by determining colour alone. The present study was undertaken to establish relationship if any, between colour and certain physical properties, like maximum water holding capacity, pore-space and real specific gravity and the mechanical component, clay, of soils.

Review of Literature: Early workers have investigated the influence of iron and organic matter on the colour of soils. The study by Fabbri (1932) on certain quaternary ancient soils of Emilia (Italy) has established a relationship between soil colour and physical properties such as capillarity, contraction of volume on drying and volume of the spaces. Asghar *et al* (1949) observed a significant positive correlation between black colour and clay or exchangeable calcium and negative correlation between red colour and exchangeable calcium. Investigations by Joshi (1950) indicated that the colour of the soil could be accounted for on the basis of the colours of its mechanical fractions. Durairaj (1951) observed that the intensity of orange hue of clay was closely and significantly correlated with the silica sequioxide ratio and total exchangeable cations. In a detailed study of soil colour in South Indian soils, Durairaj (1961) showed that chroma was not related to clay content but that it was significantly correlated with pore-space, volume expansion, moisture holding capacity, moisture equivalent, and stickypoint moisture. It was also shown that chroma improved the correlation between clay on one hand, and mechanical components, physical and soil moisture constants on the other, when included in a multiple correlation.

Material and methods: Thirty-two soil samples from four profiles of an orchard soil from Thimmapuram in Dharmapuri district, Madras State were utilised for the study. Eight samples were collected from each profile, taking samples at interval of one foot upto eight feet. The physical properties, mechanical components and the colour of all these soil were determined. The contents of clay and other mechanical components were estimated by the Robinson pipette method. The physical properties, maximum water holding capacity, pore space and real specific gravity were determined by Keen and Raczkowski method.

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Soil colour was determined, using Munsell discs. The colours of the soil samples passed through 100 mesh sieve were matched with combinations of varying areas of Munsell discs with four colour attributes viz (1) 5 R 4/14, (2) 5 Y 9/14, (3) N 1/ and (4) N 9/. The discs were carefully fitted on to the central shaft of a spinning motor and were rotated at a speed sufficient to eliminate flicker and to give a perfectly blended colour. From the percentage of the four standard colour segments used, hue, value and chroma were collected using the formulae of Nickerson (1946):

$$\text{Hue} = Z - \frac{A_1 P_1}{A_1 P_1 + A_2 P_2} (Z - X)$$

where, X = number of first hue (clockwise on the hue circle)

Z = number of second hue, A = area and P = power number

$$\text{value} = \frac{\sqrt{A_1 B_1^2 + A_2 B_2^2 + A_3 B_3^2}}{100}$$

where, B = brilliance and A = area.

$$\text{Chroma} = \frac{A_1 C_1 + A_2 C_2 + A_3 C_3}{100}$$

where, C = Chroma.

The Correlation coefficients were worked out between the different values, omitting a few markedly deviating from the general trend.

Results and Discussions: The data utilised for the study are given in Table I. There was no trend of relationship between chroma and any of

TABLE I
Analytical Data

S. No.	Depth of profile (in ft.)	Maximum water holding capacity per cent	Clay content per cent	Pore space per cent	Real specific gravity	Chroma	Value	Hue
<i>Field No. 4:</i>								
1.	1st	41.0	21.7	48	1.84	10.9	5.1	12.9
2.	2nd	46.9	19.4	51	1.77	8.4	6.3	16.3
3.	3rd	39.6	9.4	51	2.29	8.8	7.3	16.8
4.	4th	36.5	2.5	48	2.13	8.8	7.2	16.9
5.	5th	41.5	3.9	48	1.86	7.8	7.2	16.4
6.	6th	40.1	4.1	51	2.28	8.8	7.2	16.9
7.	7th	36.3	3.1	44	1.86	9.2	7.0	18.8
8.	8th	36.3	2.7	47	2.07	9.4	7.6	18.3

TABLE I (Contd.)

S. No.	Depth of profile (in ft.)	Maximum water holding capacity per cent	Clay content per cent	pore space per cent	Real specific gravity	Chroma	Value	Hue
<i>Field No. 9.</i>								
9.	1st	52.4	45.0	54	1.99	11.2	5.8	14.2
10.	2nd	35.3	43.6	48	1.81	11.0	5.4	12.9
11.	3rd	46.8	25.3	50	1.95	8.9	6.3	12.2
12.	4th	39.9	11.2	46	2.01	8.1	6.5	16.4
13.	5th	33.8	8.3	44	1.80	9.7	6.4	20.0
14.	6th	29.8	4.8	43	2.05	2.9	6.4	19.2
15.	7th	28.3	4.4	42	2.45	4.0	6.5	21.2
16.	8th	38.8	7.2	47	2.09	4.7	5.9	16.0
<i>Field No. 11:</i>								
17.	1st	25.3	7.5	37	2.66	9.5	6.0	15.3
18.	2nd	36.5	15.6	48	3.58	9.6	6.0	17.9
19.	3rd	36.9	21.2	46	2.88	8.6	6.6	18.2
20.	4th	40.9	11.0	48	3.16	7.1	6.8	20.2
21.	5th	45.3	17.7	51	3.13	7.0	7.6	19.5
22.	6th	43.4	20.8	55	3.52	8.3	7.6	17.8
23.	7th	37.2	14.1	51	3.23	7.1	7.7	21.3
24.	8th	31.0	9.7	44	2.87	6.8	8.0	21.4
<i>Field No. 15:</i>								
25.	1st	27.0	11.3	39	2.34	9.3	6.7	15.8
26.	2nd	43.8	25.4	49	2.07	8.6	5.9	14.1
27.	3rd	47.3	25.6	60	2.87	9.2	6.7	16.2
28.	4th	51.1	19.6	59	2.47	7.1	6.7	19.9
29.	5th	41.1	14.6	53	2.10	7.0	7.6	21.4
30.	6th	38.0	8.8	53	2.40	7.7	6.7	21.8
31.	7th	37.3	5.7	57	2.80	7.0	7.8	21.2
32.	8th	35.7	6.8	51	2.29	7.2	7.9	21.1

the physical properties, maximum water holding capacity, pore-space and real specific gravity or clay content. Similarly, the colour attribute 'value' also was not related to maximum water holding capacity, pore-space and clay content. Significant relationships were obtained in the cases of hue with maximum water holding capacity, clay or real specific gravity. The results of statistical analysis are given in Table II.

TABLE II

No.	Relation	Number of samples	Correlation coefficient	Regression equation
1.	Hue and maximum water holding capacity	27	-0.646†	$Y = 64.8 - 1.398X$
2.	Hue and clay	29	-0.398*	$Y = 32.4 - 1.125X$
3.	Hue and Real Specific gravity	29	+0.509†	$Y = 0.078X + 0.93$
4.	Value and Real Specific gravity	30	+0.505†	$Y = 0.325X + 0.13$

Significantly negative correlations were obtained in the cases of hue and maximum water holding capacity and hue and clay. Similarly, significantly positive correlations were obtained in the cases of hue with real specific gravity and value with real specific gravity. Most of the significant correlations were obtained with hue. Real Specific gravity influences hue as well as the value of soil colour. The scattered diagrams are given in figures one to four.

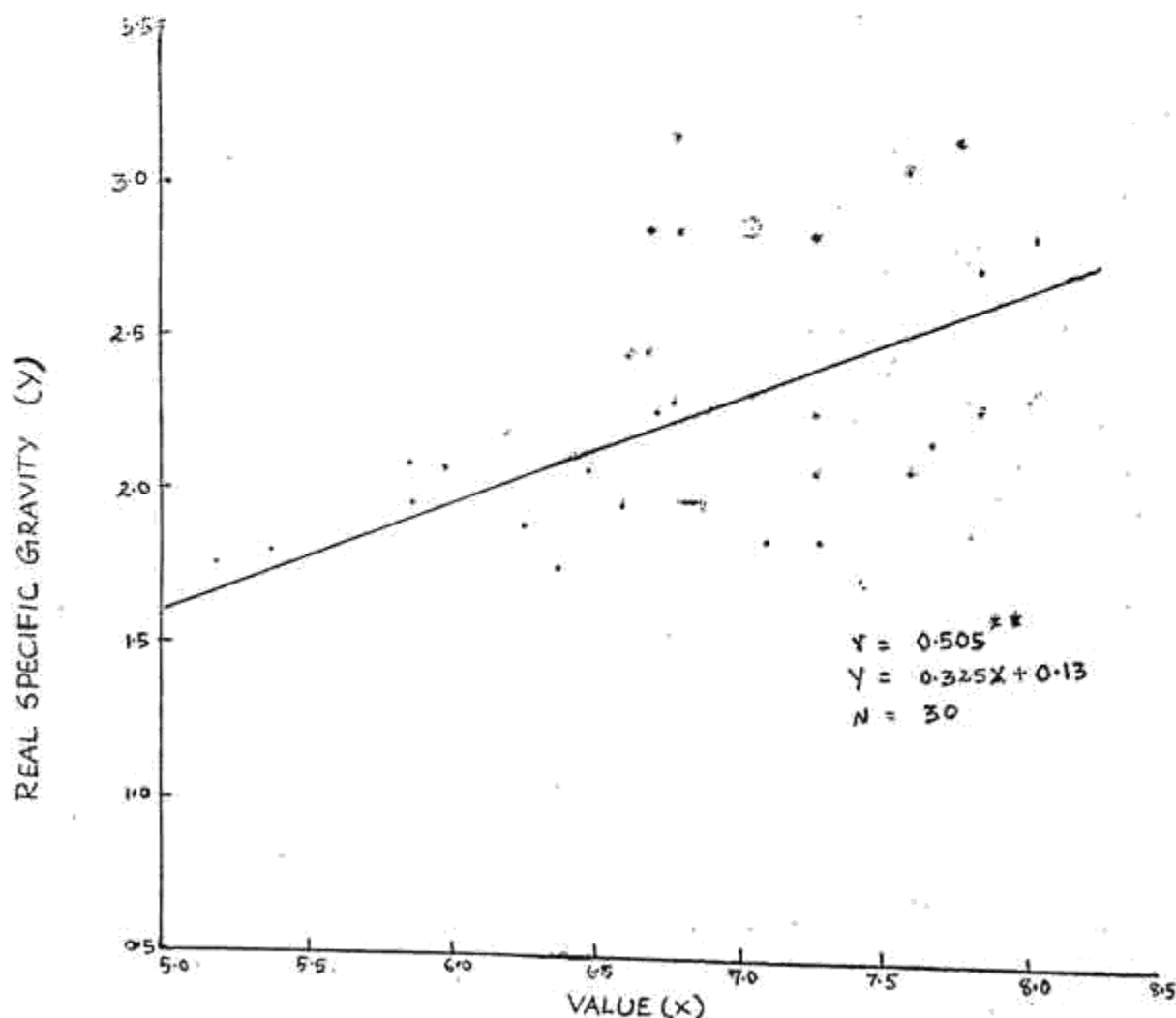


FIG. 1 VALUE AND SPECIFIC GRAVITY

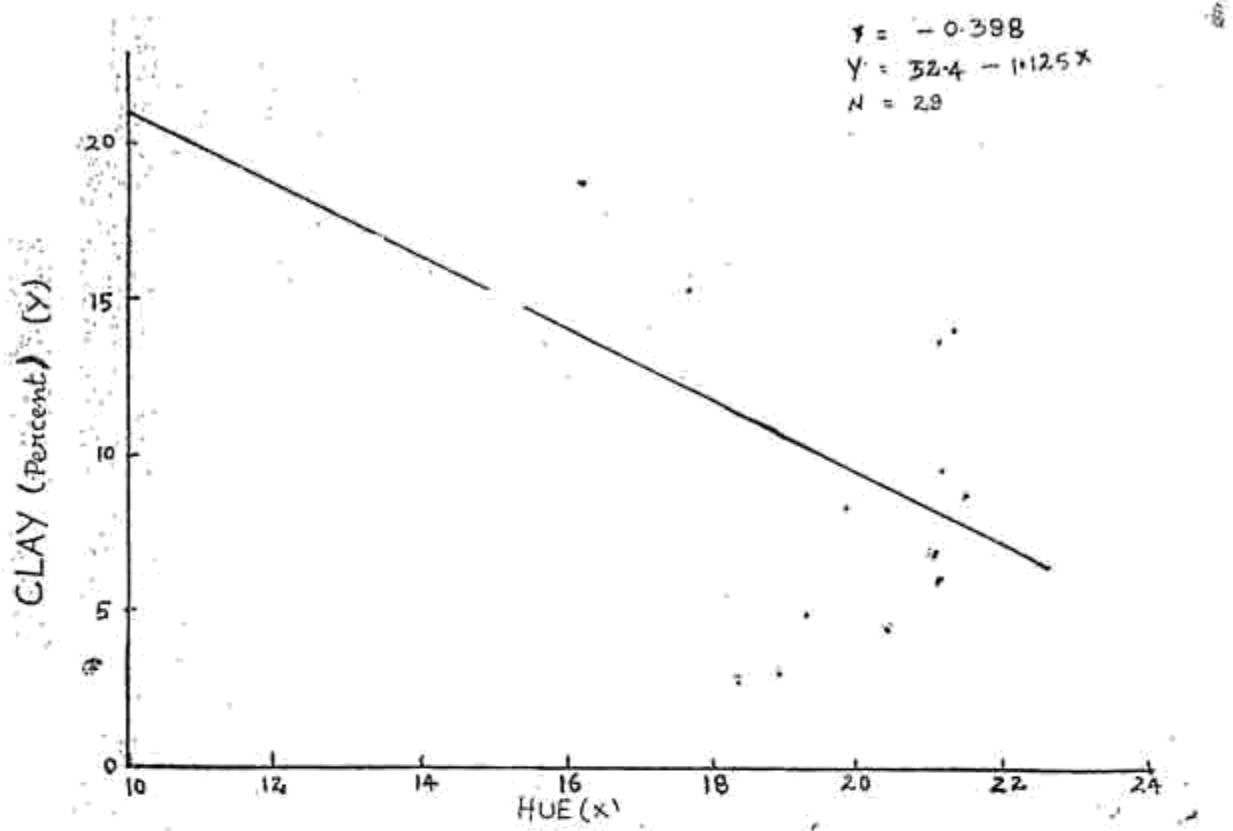
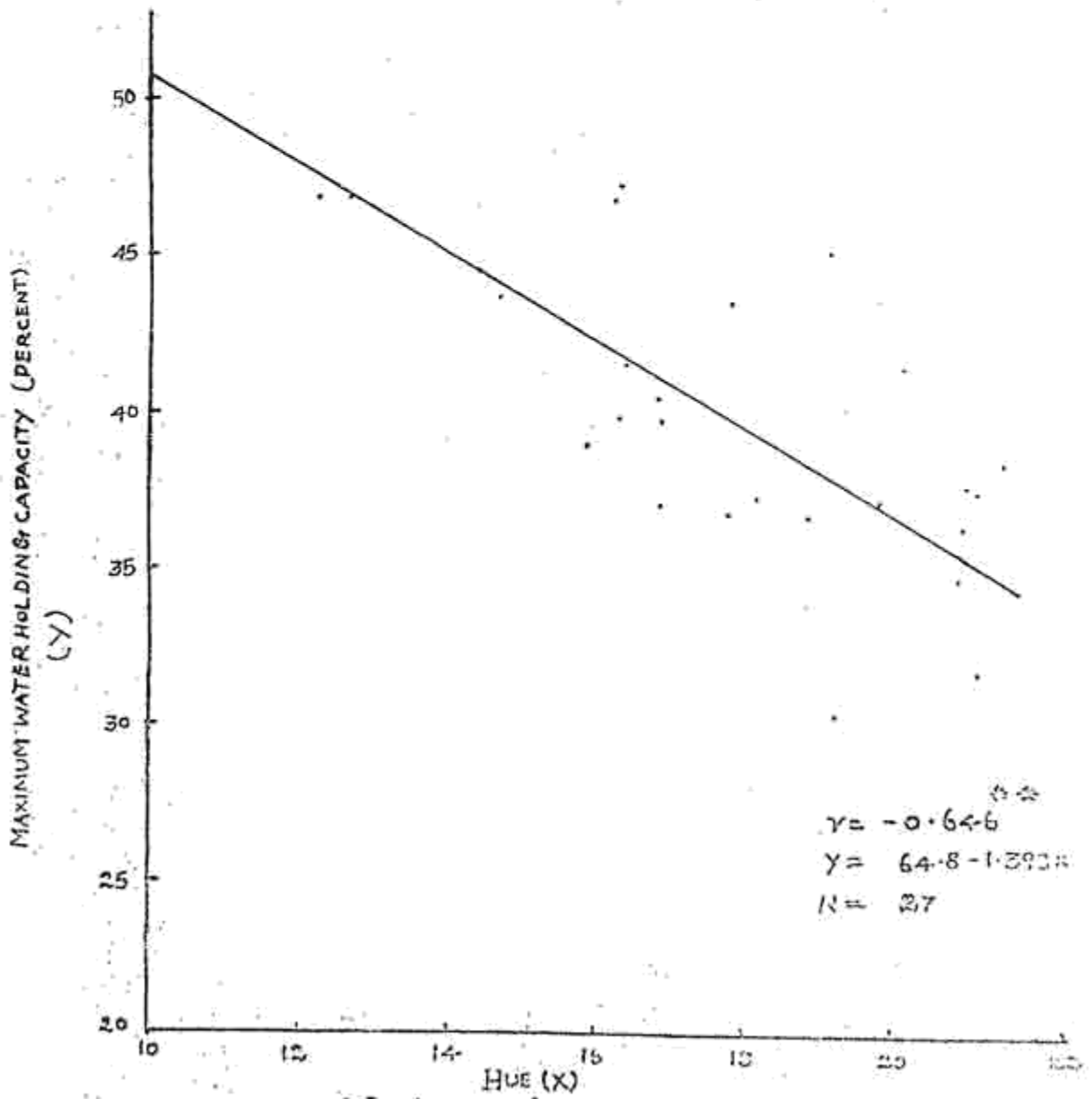


FIG. 2 HUE AND CLAY



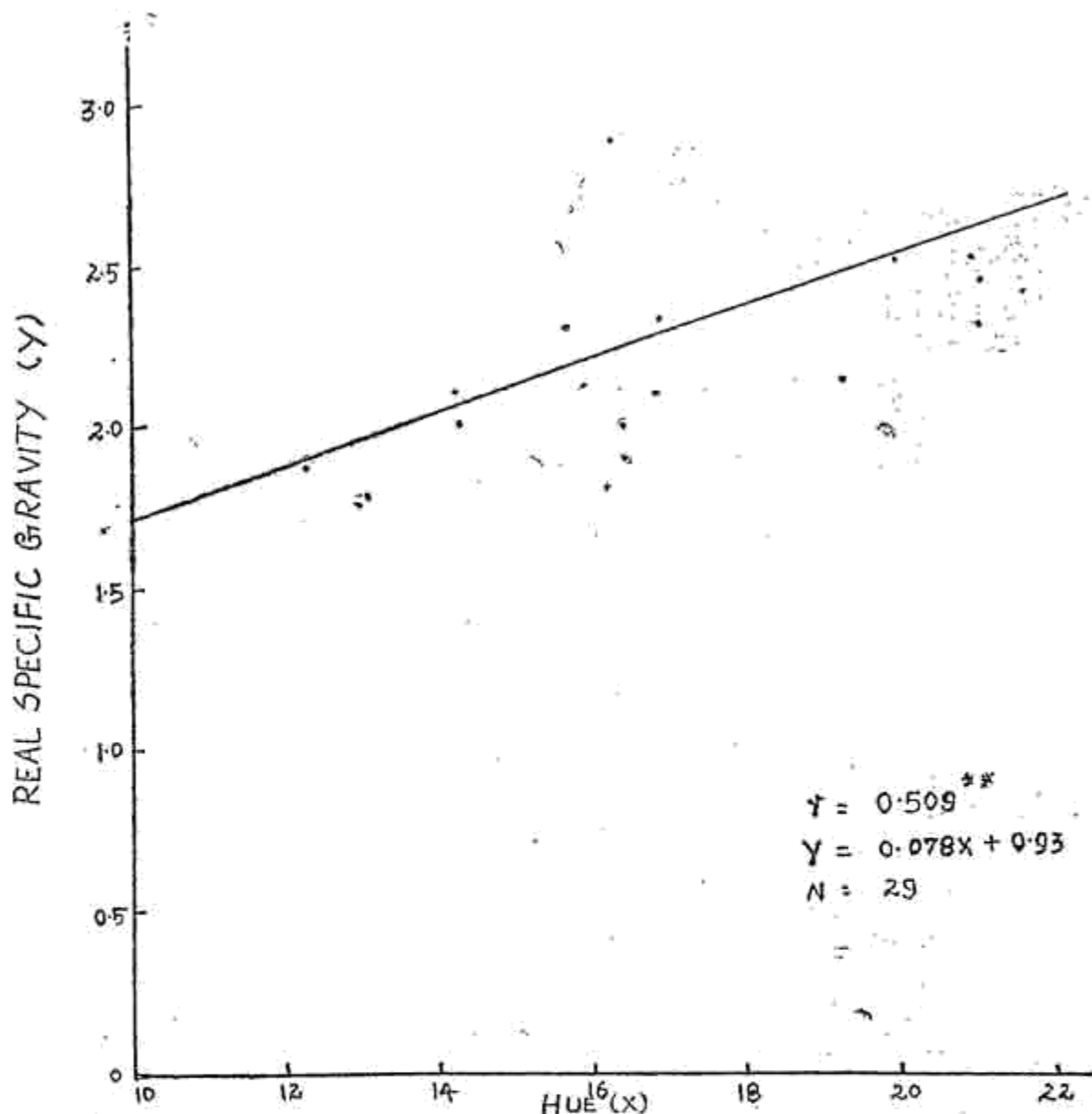


FIG. 4 HUE AND REAL SPECIFIC GRAVITY

Durairaj (1961) obtained appreciable correlations of chroma with pore space, volume expansion, moisture holding capacity, moisture equivalent and sticky point moisture. His study was with forty surface soil samples collected from different localities in Madras State. But in the present work appreciable relationships have been obtained mainly for hue and not for chroma. This may be due to the fact that profile soil samples from a restricted area have been used in the present study.

Summary and conclusion: With a view to assess the quantitative relationships between soil colour attributes and physical properties like maximum water holding capacity, pore space and real specific gravity and the mechanical component clay, thirty-two profile soil samples from an orchard in Thimmapuram were investigated. Significant relations were obtained for hue with maximum water holding capacity, clay content or real specific gravity and value with real specific gravity.

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Notes on The Aphids of Rajasthan

by

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A general survey of the aphids infesting agricultural and horticultural crops in various locales of Rajasthan viz. Ajmer, Alwar, Bharatpur, Jaipur, Kota, Udaipur and Sriganganagar was undertaken during 1963-64. The aphids collected from different food plants were got identified through the Commonwealth institute of Entomology, London. Brief notes on their occurrence, host plants, periodicity of attack have been given in this paper.

1. *ACRYTHOSIPHON PISUM*. Harris. (Pea aphid).

Synonyms: *Macrosiphum pisi*, Kalt.; *M. onobrychis*, B. d. F. *Nectarophora pisi*, Kalt & *Illinoia pisi*, Kalt.

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