# Identification of Local Soils for Development of Cricket Pitches

W.S.U. Perera[1] and U.P.Nawagamuwa[2]
*Department of Civil Engineering, University of Moratuwa*

ABSTRACT: Most of the Cricket batsmen in Indian subcontinent face a great difficulty in batting against fast bowlers on English and Australian fast and bouncy wickets. The lack of having fast and bouncy pitches in Indian subcontinent has led to this problem. It had been discovered that the pace and bounce of a cricket pitch is governed by clay content, clay mineralogy and grass content of the cricket pitch. Local pitches were found to have high silt content, low clay content and low plasticity due to a difference in clay mineralogy. In this research "Grumusol" clay was discovered in Murunkan with a comparatively high clay content which is fulfilling most of the required clay properties of a fast and bouncy wicket. Typical Sri Lankan clay sample used to prepare wickets, Clay sample from Bangalore and the local "Grumusol" sample from Murunkan were tested for the clay properties. Results showed that "Grumusol" is most suitable for constructing a fast and bouncy wicket. Other than the clay as the basic material grass plays a vital role in binding the basic material together and maintaining the required moisture levels in the wicket preventing the wicket from fracturing during the game period. Here, Crouch grass was selected as the most suitable type of grass to achieve the desired output of the fast and bouncy wicket.

## 1 INTRODUCTION

The sport Cricket has conquered every nook and corner of the world continuing its legacy on different pitches in different countries situated at different subcontinents. In this context players encounter different pitches on which their performances are questioned.

Cricket pitches have been categorized according to their ball behaviour. Players have learnt to adapt to how the pitches behave in order to perform better. Of these general categories of pitches, the most common are the "fast" and "slow" pitches (James, et al., 2005). "Fast" pitches quite commonly are "Bouncy" pitches as well while "slow" pitches are "low and spinning" pitches. Therefore the pitches are of two kinds which are known as fast and bouncy pitches, Slow and Low pitches (Nawagamuwa, et al., 2009).

All Asian countries have comparatively slow and low pitches when compared to the pitches in other subcontinents. Australia and England are popular for having fast and bouncy pitches (Carre, et al., 1999) where Asian batsmen struggle to score big numbers and the fast bowlers dominate the game.

Sri Lanka as well as most Asian countries are trying to create fast pitches in their home lands in order to enhance the player performance. Reasons for the lack of 'Pace and Bounce' in Sri Lankan pitches has been a topic of debate for a long time in the cricket arena (Nawagamuwa, et al., 2009).

To create fast pitches it is required to either import clay from foreign country which is a costly operation or to find a locally available clay which has the ideal characteristics. This research addresses the problem directly and has come up with some valuable results in order to make fast and bouncy pitches using local soil.

## 2 OBJECTIVES

Objective of this research project is to identify locally available soils that have the soil properties of a fast and bouncy wicket and a grass type to support its playing characteristics.

## 3 METHODOLOGY

Following steps were followed in this research to reach objectives.

- Study the background of the research project through literature review
- Selection of local soils that are likely having the soil property requirements and soils, which

1 Former Student 2 Senior Lecturer e-mail : udeni@uom.lk

are currently being used in Sri Lanka and India to prepare cricket wickets.

- Sample collection for laboratory experiments
- Experimental investigations to find the soil properties of the collected samples
- Analysis of results obtained from tests

## 4 EXPERIMENTAL WORK

A series of experiments was conducted according to appropriate guidelines such as BS 1377 and ASTM volume 04.08. Soil classification of three samples was done by performing particle size distribution using wet sieve analysis and Hydrometer test, Atterberg limit test, specific gravity test and Ash content test.

Particle size distribution and Atterberg limit tests were done in order to classify the selected soil samples. Rather than using the ordinary sieve analysis here a wet sieve analysis is done because the soil is nearly clay.

The primary objective of wet sieve analysis test was to separate the particles greater than 0.075mm and doing the sieve analysis for the greater size particles.

Liquid limits, Plastic limits and Plasticity Index were found by Atterberg limit tests.

Ash content test was used to determine the organic matter content of the selected clayey soil samples. Classification of the soils was done using the Unified Soil Classification Method.

## 5 RESULTS AND DISSCUSSION

### 5.1 *Particle size distribution*

Particle size distribution shows the amount of finer particle (which are usually clay and silt) content of a soil and the soil grading. This can be determined by the sieve analysis test and Hydrometer test. There are four methods to analyze the particle size distribution. They are air dry-dry sieve, air dry - wet sieve, oven dry-dry sieve and oven dry-wet sieve. When the particles are bonded together, it will become a larger size particle. Therefore, dry sieve may not provide accurate results in this situation where the accuracy should be high in finding the clay content of these soils since the clay content will be the key factor to produce the pace and bounce of a wicket. So wet sieve analysis gave better results for the particle size distribution above 0.075mm range.

Hydrometer test gives a better picture of the finer content, which are below 0.075mm. Combining both test results, the ultimate particle size distribution graphs were drawn.

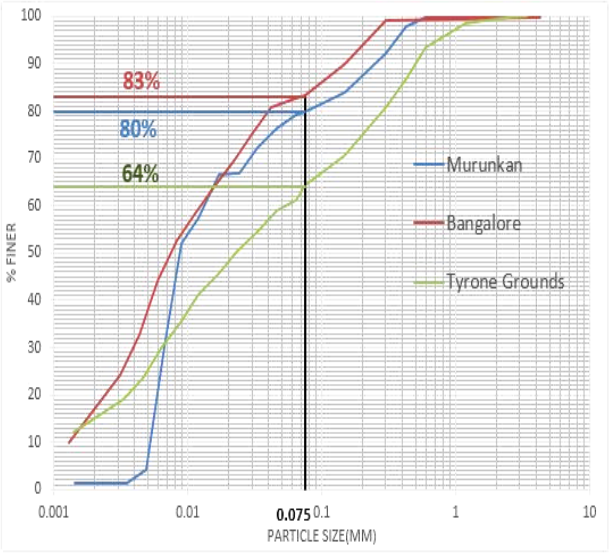


Figure 1 Comparison between Particle size distributions

From the results of particle size distribution it is obvious that Bangalore soil sample has 83% finer particles. This implies that the Bangalore soil sample is rich with finer particles than the “Grumusol” sample and the sample from Tyrone Fernando Stadium. ”Grumusol” sample and the Sample from Tyrone Fernando Stadium have 80% and 64% respectively. Since the Bangalore sample was taken from a developing fast pitch it may have much finer particles. However, the “Grumusol” soil has little lower value than the Bangalore sample (value of 80%) which can be identified as a soil of similar high clay and silt content. In contrast the currently used soil in SL pitches gives 64% which is comparatively a lower value for the finer particles, confirming high sand and organic content in that soil. These components definitely lead to the unexpected breaking of the wicket surface (Wicket may turn in to an uneven surface including coverts and dust). Moreover the friction development by sand reduces the speed as well as the bounce of the ball. This scenario makes SL pitches slow and low when compared to fast and bouncy Australian pitches which have much low sand content (6%) (Nawagamuwa, et al., 2009). In addition when the soil grading of 3 samples are considered, “Grumusol” is more poorly graded at finer particle range. Poorly graded soil may lead to less binding. Therefore, it must be prevented by adding other soils to fill in the gap ranges along with a suitable grass.

### 5.2 *Atterberg Limit Tests*

Primary objective of the Atterberg limits test is to find the Plastic and liquid limits and the find the plasticity index. The test was done using Casagrende's instrument.

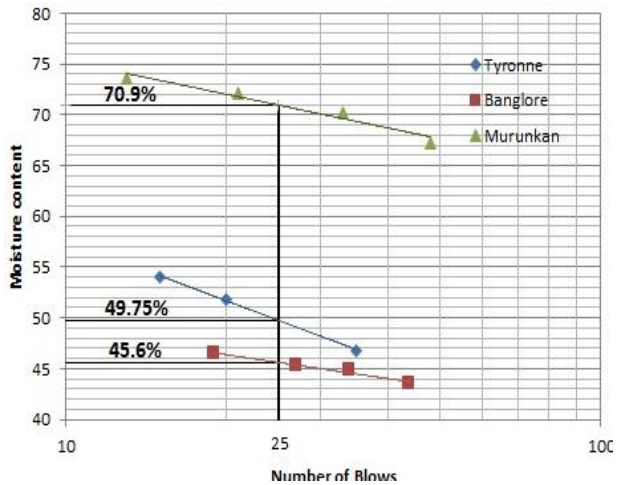


Fig. 2 Liquid limit plot

Atterberg test results shows that the "Grumusol" sample taken from Murunkan gives comparatively higher liquid limit (70.94%) and higher Plastic Index (42.8%) which indicates that it consists of a comparatively higher clay content than the designed fast pitch in Bangalore. In contrast the prevailing soil in SL pitches gives low liquid limit and lower Plastic Index which indicates the lower clay content which again gives the reason of being slow and low.

Usually Australian fast pitches have a clay content of 51%- 82% which is a higher value. Therefore this test results indicates that the "Gumusol" sample from Murunkan matches with the clay requirement of a fast pitch.

Table 1 Plastic and Liquid limits

| Soil Sample | LL% | PL% | PI% |
|---|---|---|---|
| Tyrone Grounds | 49.75 | 30.48 | 18.27 |
| Bangalore | 45.6 | 18.6 | 27 |
| Murunkan | 70.94 | 28.14 | 42.8 |

### 5.3 *Specific Gravity Test*

Specific gravity value of sample was determined according to BS 1377: part 1, Pycnometer method.

Table 2 Specific Gravity of the samples

| Soil Sample | Specific Gravity (G) |
|---|---|
| Tyrone Grounds | 2.35 |
| Bangalore | 2.53 |
| Murunkan | 2.52 |

### 5.4 *USCS Classification*

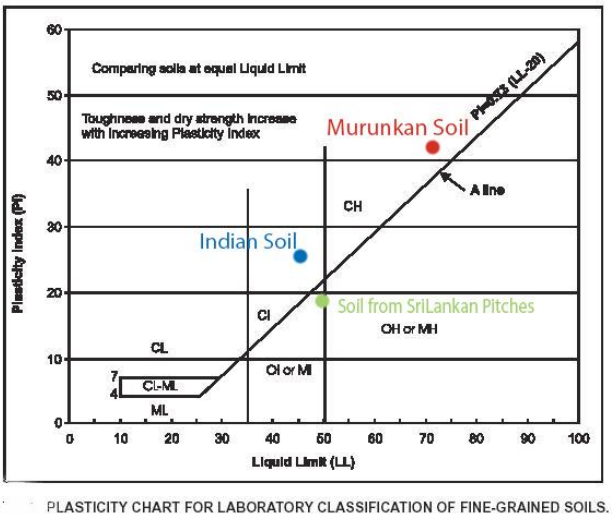


Fig. 3 USCS classification chat

USCS classification clearly separates 3 samples into 3 categories. Sample taken from Tyrone Fernando Stadium is in OH/ MH range which are Inorganic silts, fine sandy, silty soil or elastic silts. This leads to the untimely cracking of the Sri Lankan pitches into dust.

Bangalore sample is in CL range which is inorganic clays with low to medium plasticity, and it meets the required standards to some extent.

"Grumusol" sample falls in CH range which is inorganic clays of high plasticity, Fat clays. Then, "Gumusol" sample from Murunkan corresponds to the clay type of a fast pitch.

### 5.5 *Selection of Grass*

Warm-season grasses such as couch grass (Cynodon dactylon) and kikuyu grass (Pennisetum clandestinum) are more efficient in using water and have better drought tolerance than the cool season grasses such as ryegrass (Lolium perenne), fescue (Festuca sp.) A saving of approximately 40 to 50%

in water use can be achieved with warm-season grasses compared to cool-season grasses (Michael, 2012). Therefore variety of couch grass types will be suitable for hot and humid conditions in Sri Lanka.

Another advantage of warm-season grasses is that without an adequate supply of water (e.g.under water restrictions), sports surfaces consisting predominantly of cool-season grasses will lose cover, become tufty, have excessive hardness and often become unsafe. Warm-season grasses have a greater capacity to maintain good density and have a creeping growth habit that is less likely to become tufty during periods of extreme heat and low rainfall (Michael, 2012). Therefore warm season grass will be ideal for an equivalent situation of 5 day test cricket match without any water throughout the game.

"Santa Ana" which is a variety of couch grass and it can be identified as the most suitable grass for Sri Lankan cricket wickets considering its Quality, Colour retention/Dormancy, Cover under wear and Cover Density. For further proceedings of this research a locally available grass having same properties of "Santa Ana" should be identified.

## 6 CONCLUDING REMARKS

Cricket is an unpredictable game which can turn its momentum completely upside down in several seconds. Though the main role is acted by the bat and the ball the pitch/wicket plays a huge hidden role which is a key factor of deciding the day's champion team.

Due to the soil properties of the wicket, the playing characteristics of one pitch differs from others.

Australian and England pitches are considered as "Fast and Bouncy" pitches while the Indian subcontinent pitches are considered as "Slow and Low" pitches. This nature is inherited by a pitch due to aforementioned soil properties of wicket itself.

Since the importing of soil is a costly operation, finding a reliable source which meets the requirement of a soil in fast and bouncy wicket is a great advantage for a developing country like Sri Lanka.

In this research project three samples were tested for the soil properties. The "Grumusol" sample from Murunkan shows its higher potential for a fast pitch soil, while the soil from Bangalore meets the requirement to some extent. In contrast the currently used soil in Sri Lanka has higher silt, sand and organic impurities which is the reason of being slow and low.

Moreover, to keep the clay particles together while maintaining the strong bond and reducing the crack openings in extreme hot temperature and humid conditions *Cynodon dactylon* (Crouch grass) is ideal (Michael, 2012). This situation could be considered as equivalent to Sri Lanka when considering the tropical hot weather conditions.

"Grumusol" will be the solution for the local soil requirement in order to develop a fast and bouncy wicket in Sri Lanka.

Further model testing should be carried out in order to find the friction and the bounce generated by pure/mixed clay samples having almost the same soil properties.

## 7 REFERENCES

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