ABSTRACT
The study centred on the development of predictive equations to determine soil contaminated with sodium chloride geotechnical properties at given level of cation exchange capacity (CEC), exchangeable anion and cation. Soil samples for the work were taking from two borrow pits in Ibadan, Nigeria. Aside the control, each sample was divided into sixteen and grouped into. Each group received a single dose of 10, 30, 50 and 70 g/dm³ and their geotechnical and chemical monitored for 365 days. The geotechnical properties obtained were used as dependent variables while chemical properties as independent variables in multiple regression model to generate fourteen equations for estimating soil geotechnical properties at specified levels of chemical properties. The results revealed that the two soils geotechnical properties except coefficient of permeability decrease with increase in salt concentrations and time. Also, the differences between the measured and predicted or simulated geotechnical properties were in the range of -10.08 and +6.51 %.

KEY WORDS
Model development, Geotechnical properties, Salt concentration, Soil contamination, Mathematical modelling

1. Introduction

Nearly all structures are sited on soils: The foundations of structures such as buildings, roads, dams, bridges, etc are designed based on the prevailing circumstances of the soil. After thorough geotechnical study, the type of foundation for a particular structure is agreed upon and construction of interfacial element would commence. Site investigation results show the immediate condition of the soil even though engineers employ factors of safety to predict the likely future condition of the soil with response to loading. This approach often time may not be economical or totally misleading. In many site investigations, little emphasis is placed on the estimation of chemicals present in the soils. When such is considered, their effect on concrete structure, underground water and health is always examined. Nowadays, it has been accepted that soil contains numerous chemicals originating from its formation and other contaminants introduced due to man-made activities. These chemicals undergo a lot of interactions or reactions that cannot be easily ascertained. The products of such reactions would have direct consequence on the resulting soil properties. In addition, structures are built on contaminated soils such as old refuse dumpsite without proper geophysical studies. Little efforts have been exercised to know the impacts of contaminants in soils. The study centered on developing predictive equations using multiple regression statistical model for investigating the influence of sodium chloride on soil geotechnical properties.

Yanful (1982) reported increase in hydraulic conductivity of approximately two orders of magnitude for samples of glacial clays from Ontario permeated with brine. Ho (1985) presented data on the effects of a NaCl brine on the grain-size curve for Indian Head till and Regina clay. He found no significant difference in grain size between water samples and samples prepared with NaCl brine. Barbour and Fredlund (1989) and Maio (1996) have shown that on exposure to concentrated salt solutions, volume changes of saturated clay soils also occurred from fluid flow out of the clay in response to chemical concentration gradients. Barbour and Yang (1993) experimented on the effect of brine on clay. They concluded that an increase in salt pore fluid concentration results in a decrease in the liquid limit, little change or a slight increase in the plastic limit, and consequently a decrease in the plastic index or the plasticity of the soil.

Ikejir and Tanimoto (1993) showed that the effect of cation was very little on tan φ. Clays show depending on their mineralogy, considerable changes in properties when exposed to salt solutions. Torrance and Ohtsubo (1995) reported the decrease of the liquid limit of the Na-saturated Ariake clay as the salinity of the pore water decreased. The liquid limit of a Na-saturated sample for Bangkok-clay increased with increasing NaCl concentration and when substituting Ca for Na in a similar manner to Ariake clay, but the extent of the liquid limit change by such treatments was much smaller for Bangkok clay than for Ariake clay (Ohtsubo et al, 2003).

Using four different clays and three chloride salts (NaCl, KCl and CaCl2), Schmitz and van Paasen (2003) reported reduction in the liquid limit as salt molarity
increased. Lee et al (2005) also investigated the effect of CaCl2 solutions with concentration of 5, 10, 20, 50, 100, and 500 mM on the liquid limits of GCLs. Similarly, Sivapullaiah and Manju (2005) investigated the same geotechnical properties of a low plasticity soil (w/L= 38%) using NaOH solution. They reported that the liquid limit of the test soil increased with increasing NaOH concentration due to the forming of new swelling compounds. Relationships between tangent of angle of internal friction (tan φ) of soil and ion concentration of Na and Ca were reported by Suzuk et al (2005). Arasan and Yetimoglu (2008) used salt solution in-place of distill water for determination of clay soils liquid and plastic limits. The results showed that increase in the salts (copper sulphate, iron sulphate and potassium chloride) led to increase in CL-clay liquid and plastic limits. The reverse was obtained for CH-clay. In nearly all the literatures examined, salts were added to water used in carrying out liquid and plastic limits. The effect of actual reaction of salts with soil elements (minerals) over time was not considered.

2. Materials and Method

2.1 Soil Geotechnical and Chemical Properties Determination

Soil samples labelled A and B were obtained from two borrow pits along Apete road on coordinates (E 0596847m, N 0822298m) and Ajibode road on coordinates (E 0599779m, N 0826452m) in Ibadan, South-Western Nigeria respectively. In order to determine the range of concentrations of inorganic contaminants to be added to the soil sample, preliminary survey of existing levels of soil contamination in literature was embarked upon. In addition, the composition of seawater was also examined. The salt solution was prepared in accordance with Vogel’s standard (Mendham et al, 2000). The right quantities of sodium chloride (NaCl) analar grade were diluted with required amount of distilled water to produce 10, 30, 50 and 70g/dm3 concentrated salt solutions as shown in Fig. 1.

Aside control, each soil sample was divided into sixteen samples and grouped into four. In order to ensure equal density of soil samples in each plastic container, each soil layer of 30kg received 62 strokes using wooden pestle. Altogether, 180 kg of soil was used to fill a single container. The soil samples groups names for soil sample A were A1, A2, A3 and A4; likewise those of soil B were B1, B2, B3 and B4. About 20 litres over board was left in each container not occupied with soil. The prepared inorganic salt solutions were applied by gravity to soil samples.

Within the frame work of this research, the geotechnical properties of the two soils and those of thirty two contaminated soil samples were monitored for 365 days. The geotechnical properties of interest were particle size analysis, Atterbege limits (liquid limit LL and Plastic limit PL), compaction test, California bearing ratio (CBR), specific gravity (SP), permeability test (CP) and shear strength (angle of friction φ and cohesion c ) in accordance with BS 1377 (1990). The soil chemical properties monitored were cation exchange capacity (CEC), exchangeable cation Na+, and exchangeable anion Cl- The controlled and contaminated soil samples chemical properties determinations were carried out in accordance with BS 1377 (1990) and the recommended soil chemical test procedures by Agricultural Experiment Stations of North Central Region of United State of America (1998).

2.2 Predictive Model Development

The field work revealed that the quantity of soil taken from each container for geotechnical properties determination with time have different values of CEC, exchangeable cation and anion. The revelation made it difficult to ascertain the response of soil geotechnical properties with constant level of CEC and exchangeable cation and anion with time. In order to investigate the variation in geotechnical properties of the soil with uniform chemical properties, a predictive model yielding a set of equations was developed. The model was developed for the two soils under the influence of the NaCl separately.

Multiple linear regression statistical package was used to model the relationship between the soil geotechnical properties (dependent variables) and chemical properties (independent variables). The general regression model is usually expressed by an equation

\[ \mu = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \ldots + \beta_n x_n \]

Where:
- \( \mu \) = Dependent variable
- \( x_1, x_2, \ldots, x_n \) = Independent variables of order \( n \)
- \( \beta_1, \beta_2, \beta_3, \ldots, \beta_n \) = Regression coefficients
- \( \beta_0 \) = Value of \( \mu \) when independent variables are zero or the intercept on y-axis (Larsen, 2008). For each borrow pit, the dependent variables were LL, PL, c, φ, CBR, Gs and CP. In addition, the independent variables were CEC, exchangeable cations and anions. The model was developed for each measured geotechnical parameter.
under the influence of each salt. For instance, the predictive model obtaining LL of soil at Apete borrow pit contaminated with NaCl salt with time was developed as follows:

The independent variables used were time $\Delta t$, $\Delta$CEC, $\Delta$Na$^+$ and $\Delta$Cl$^-$.

Where:

$\Delta t = T_1 - T_0$, 
$T_1$ = Predictive time in days,
$T_0$ = Initial time taken as zero.

$\Delta$CEC = CEC$^*$ − CEC$^0$

CEC$^*$ = Expected CEC at predictive year in cmol/kg

CEC$^0$ = CEC of uncontaminated soil in cmol/kg

$\Delta$Na$^+$ = Na$^+$ $-$ Na$^+_0$

Na$^+_0$ = Exchangeable Na$^+$ for uncontaminated soil in cmol/kg

$\Delta$Cl$^-$ = Cl$^-$ $-$ Cl$^-_0$

Cl$^-_0$ = Exchangeable Cl$^-$ for uncontaminated soil in cmol/kg

The dependent variable was liquid limit LL

The general multiple regression equation reduced to

$$LL^* = \beta_0 + \beta_1 \Delta t + \beta_2 \Delta$CEC + $\beta_3 \Delta$Na$^+$ $-$ $\beta_4 \Delta$Cl$^-$

(1)

Where:

$\beta_0$ = Liquid limit for uncontaminated soil

Regression coefficients estimation:

These values were obtained using Origin 8.0 statistical package. The program input data were values of the four independent variables and one dependent variable. The output data among others were the regression coefficients and the $R^2$ values. The $R^2$ values revealed the level of prediction of dependent variable by independent ones.

The regression model below was obtained:

$$LL^* = 41.83 + 1.919 \times 10^{-5} \Delta t - 0.454 \Delta$CEC - 0.304 $\Delta$Na$^+$ $-$ 2.38 $\times 10^{-3} \Delta$Cl$^-$

(2)

$R^2 = 0.974$ (97.4%)

The procedure above was repeated for all other geotechnical properties and the models generated were recorded. Altogether, fourteen predictive equations were generated for the two soil samples (Tables 1 and 2).

### 3. Results and Discussion

The particle size analyses of the two soils A and B were carried out after each was thoroughly mixed together to produce homogeneous soil. The grading test curves were displayed in Fig. 2a and Fig. 2b. The result showed that the two soils were well graded but soil A was of more blended type than B. Furthermore, soil A has more particles finer than 0.045mm (i.e. 9.26%). On average, at the end of 364 day the LL of Apete soil has reduced from 42% to 39.1, 38.8, 38.5 and 38.4% for the soil samples that received 10, 30, 50 and 70g/dm$^3$ of NaCl salt respectively (Table 3). This result is similar to that of Barbour and Yang (1993) but different from that of Torrance and Ohtsubo(1995). The soil samples ions exchange cation Na$^+$ increased from 0.10 to 1.30, 1.72, 1.81, and 1.92 cmol/kg in the order of increase in salt concentrations. Furthermore, CEC increased from 1.568 to 5.834, 5.904, 6.402 and 6.023 cmol/kg as salt concentrations increased.

![Grading curve of soil A](image1)

![Grading curve of soil B](image2)

The soil A due to influence of NaCl salt, has its exchangeable anion Cl$^-$ increased from 21.8 to 497, 519, 520 and 528 in the order of increasing in the salt concentrations. With reference to Table 2, when CEC, Na$^+$ and Cl$^-$ were less than 2.32, 0.18 and 118.0 cmol/kg respectively for soil A, the soil liquid limit decreased by 1.7%. Beyond this level, the reduction was very high. On the other hand for soil B with CEC, Na$^+$ and Cl$^-$ levels below 2.46, 0.19 and 117.8 cmol/kg respectively, the measured liquid limit was 3.3% lower than the uncontaminated value (Table 4). Beyond these levels, the reduction in liquid limit was very high up to 11.9% when the values of CEC, Na$^+$ and Cl$^-$ rose to 6.99, 2.03 and 520.0 cmol/kg respectively. The results showed that due to presence of more Na$^+$ and Cl$^-$ in the soil, the forces holding the soil particles together tend to become weaker. Therefore, lesser quantity of water was required to break the bond created. Similar behaviour was observed for Ajibode soil B as shown in Table 4.
Under the influence of NaCl salt concentrations, reductions in the plastic limit of both Apete and Ajibode soils were observed as shown in Tables 3 and 4. For Ajibode soil, the uncontaminated PL was 22.0%, which was reduced to 18.5, 18.4, 18.2 and 18.1% as a result of the presence of the 10, 30, 50 and 70 g/dm of salt respectively. When the CEC, Na+ and Cl- values in soil B were 2.46, 0.19 and 117.83 cmol/kg respectively, the measured plastic limit was 3.2% lower than the control value. Above this level, the reduction witnessed in soil B was up to 17.7%. The reduction occurred due to replacement of other cations with Na’ that is very weak in the ion exchange series.

The soil shear strength parameters were determined for both contaminated and uncontaminated soils using triaxial undrained compression test method. Presence of NaCl in the two soils led to reduction in soil cohesion and angle of friction. The values of cohesion of Ajibode soil B reduced from 40.0 to 30.5, 28.5, 28.0 and 27.0 kN/m2 for samples contaminated with 10, 30, 50 and 70g/dm3 of NaCl salt concentrations respectively (Table 4). The shear strength parameters are surface dependent and whatever will affect or change the soil mineral surface nature will have adverse effect on these parameters. The replacement of strong cations in the soil (clay) minerals with Na+ or attraction of Na+ to clay minerals would weak the bonds among clay minerals. Invariably, reduction in shear strength parameters would be observed. This accounts for the reduction in the observed cohesion and angle of internal friction of the two soils. The findings deferred from those of Suzuk et al (2005).

The uncontaminated and contaminated soil samples CBR were determined using the unsoaked CBR method. The results shown in Tables 3 and 4 reveal that the soil A CBR values reduced from 14.9 to 12.65% (least value) while that of soil B from 10.68 to 8.3% (worst value) due to NaCl contamination. The shear strength of the soil is controlled by existing bonds among particles and internal particle friction which would resist applied stress in the soil. In the same manner, CBR is a measure of soil ability to resist penetration of cone plunger. If the bonds among particles and internal friction are strong enough, large magnitude of forces would be required to have 2.5mm and 5.0mm penetration for CBR measurement. Consequently, the higher the bonds and internal friction, the higher would be the expected CBR values for such a soil and vice versa. The replacement of strong cations or attraction of clay minerals by weak Na+ would result in production of less strong bond that provides least resistance to plunger penetration in soil. This account for the reduction in the soils CBR values as a result of contaminating them with NaCl salt of varying concentrations.

The coefficient of permeability values of the soil A at Apete increased from 5.243x10-6 to 9.612x10-6 mm/s while those of Ajibode from 5.688x10-6 to 9.462x10-6 mm/s as shown in Tables 3 and 4. The result was in agreement with the outcome of the work of Yanful (1982). Yanful (1982) discovered that the glacier clay hydraulic conductivity increased when it was permeated with brine (NaCl solution). The weak bond produced by Na+ in the adsorbed layer of clay constitute least resistance to the passage of water, hence the increase in soil coefficient of permeability observed.

The soil specific gravity is used to denote the ratio of mass of a given solid soil particles (inclusive of the inside impermeable voids) to the weight of an equal volume of distilled water at the same temperature. Expected to affect the specific gravity in this context would be the impermeable void that depends on the internal arrangement of soil unit elements. The specific gravity of soil A reduced from 2.58 to 2.42 while that of soil B from 2.36 to 2.19 as revealed in Tables 3 and 4. Na+ is a monovalent ion and can only attract one OH- from unit element of clay. Their inability to attract more than one unit element will go a long way to increase impermeable void present in soil grain. With increment in impermeable void, the soil grain of the same mass would occupy area of larger volume. As such, the reduction in specific gravity would occur. Tables 3 to 4 showed the results of the geotechnical properties, chemical properties and model generated soil properties of the two soils under the influence of sodium chloride.

The model results and the measured values of the soil geotechnical properties were very close. The differences between the measured and model simulated values were in the range of -10.08 to +6.51%. Base on the high level of accuracy attained, the model developed can be used to forecast the soil geotechnical properties at any particular levels of CEC, exchangeable cations and anions in the soil.

4. Conclusion

The study revealed that addition of sodium chloride concentration of different proportions to the two soils led to reduction in the soil liquid limit, plastic limit, CBR, cohesion, angle of friction and increase in the soil permeability. The reductions or increment in geotechnical properties observed or obtained were initially very rapid but gradually very slow towards 360 days of contamination. The model developed led to generation of fourteen predictive equations for estimating soil geotechnical properties at given level of CEC, exchangeable cation and ion. In addition, the differences between the measured and model simulated geotechnical properties of the soils were in the range of -10.08 to +6.51%.

References


J.K. Torrance, & M. Ohtsubo, Ariake Bay quick clays a comparison with the general model, *Geotechnical Engineering, University of Saskstchewan, Saskatoon, 1985)*.


### Table 1. The regression models equations for soil samples A

<table>
<thead>
<tr>
<th>Salt</th>
<th>Model equation</th>
<th>R²</th>
</tr>
</thead>
<tbody>
<tr>
<td>NaCl</td>
<td>LL₄ = 41.83 + 1.919x10⁻³Δt - 0.454ΔCEC + 0.304ΔNa⁺ - 2.38x10⁻³ΔCl⁻</td>
<td>0.974</td>
</tr>
<tr>
<td></td>
<td>PL₄ = 19.44 + 1.019x10⁻³Δt - 0.409ΔCEC - 4.54x10⁻²ΔNa⁺ - 3.50x10⁻³ΔCl⁻</td>
<td>0.991</td>
</tr>
<tr>
<td></td>
<td>cₑ = 54.271 + 1.01x10⁻³Δt - 2.071ΔCEC - 2.519ΔNa⁺ - 9.84x10⁻³ΔCl⁻</td>
<td>0.984</td>
</tr>
<tr>
<td></td>
<td>φₑ = 13.83 - 4.1x10⁻²Δt - 0.316ΔCEC - 0.369ΔNa⁺ - 2.418x10⁻²ΔCl⁻</td>
<td>0.962</td>
</tr>
<tr>
<td></td>
<td>CBRₑ = 14.81 - 2.55x10⁻⁴Δt - 0.307ΔCEC - 0.194ΔNa⁺ - 4.2x10⁻⁴ΔCl⁻</td>
<td>0.993</td>
</tr>
<tr>
<td></td>
<td>CPₑ = 5.324x10⁻⁶-2.607x10⁻¹⁰Δt+2.577x10⁻³ΔCEC+1.316x10⁻⁶ΔNa⁺+1.09x10⁻⁹ΔCl⁻</td>
<td>0.989</td>
</tr>
<tr>
<td></td>
<td>SPₑ = 2.573 + 3.757x10⁻⁵Δt - 5.95x10⁻⁴ΔCEC - 3.76x10⁻³ΔNa⁺ - 1.07x10⁻⁴ΔCl⁻</td>
<td>0.970</td>
</tr>
</tbody>
</table>

### Table 2. The regression models equations for soil samples B

<table>
<thead>
<tr>
<th>Salt</th>
<th>Model equation</th>
<th>R²</th>
</tr>
</thead>
<tbody>
<tr>
<td>NaCl</td>
<td>LL₄ = 35.85 + 3.5x10⁻⁷Δt - 0.787ΔCEC - 8.06x10⁻⁷ΔNa⁺ - 1.46x10⁻⁴ΔCl⁻</td>
<td>0.963</td>
</tr>
<tr>
<td></td>
<td>PL₄ = 21.927 + 8.55x10⁻⁴Δt - 0.453ΔCEC + 0.204ΔNa⁺ - 4.20x10⁻³ΔCl⁻</td>
<td>0.987</td>
</tr>
<tr>
<td></td>
<td>cₑ = 39.842 + 1.01x10⁻³Δt - 0.939ΔCEC - 3.247ΔNa⁺ - 3.69x10⁻³ΔCl⁻</td>
<td>0.994</td>
</tr>
<tr>
<td></td>
<td>φₑ = 15.903 + 1.26x10⁻⁷Δt - 0.421ΔCEC - 0.477ΔNa⁺ - 1.52x10⁻⁷ΔCl⁻</td>
<td>0.990</td>
</tr>
<tr>
<td></td>
<td>CBRₑ = 10.63 + 8.631x10⁻⁴Δt - 0.433ΔCEC + 3.863x10⁻⁵ΔNa⁺ - 1.30x10⁻⁴ΔCl⁻</td>
<td>0.997</td>
</tr>
<tr>
<td></td>
<td>CPₑ = 5.745x10⁻⁶-4.969x10⁻¹⁰Δt+4.374x10⁻⁷ΔCEC+4.907x10⁻⁵ΔNa⁺+1.343x10⁻⁷ΔCl⁻</td>
<td>0.994</td>
</tr>
<tr>
<td></td>
<td>SPₑ = 2.346 + 1.618x10⁻⁴Δt - 2.76x10⁻⁵ΔCEC + 3.693x10⁻⁵ΔNa⁺ - 1.46x10⁻⁵ΔCl⁻</td>
<td>0.946</td>
</tr>
</tbody>
</table>
### Table 3. Comparison between model results and measured results for soil samples A under the influence of NaCl

<table>
<thead>
<tr>
<th>Soil group</th>
<th>Time (Day)</th>
<th>CEC</th>
<th>Na</th>
<th>Cl</th>
<th>LL</th>
<th>PL</th>
<th>c</th>
<th>φ</th>
<th>CBR</th>
<th>PC</th>
<th>SP</th>
<th>% Diff btw measured and model results</th>
<th>Model Geotechnical properties</th>
<th>% Diff btw measured and model results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>0</td>
<td>0.03</td>
<td>0.042</td>
<td>0.219</td>
<td>0.055</td>
<td>0.14</td>
<td>0.10</td>
<td>0.25</td>
<td>0.0000055340</td>
<td>0.0000055340</td>
<td>2.56</td>
<td>0.40 - 0.82 1.33 1.21 0.60 - 1.54 0.27</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A1</td>
<td>7</td>
<td>0.434</td>
<td>0.02</td>
<td>0.392</td>
<td>0.19</td>
<td>0.535</td>
<td>0.136</td>
<td>0.147</td>
<td>0.0000055340</td>
<td>0.0000055340</td>
<td>0.13 - 0.69 0.92 0.11 0.10 0.56 - 0.22</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A2</td>
<td>7</td>
<td>0.512</td>
<td>0.02</td>
<td>0.492</td>
<td>0.145</td>
<td>0.535</td>
<td>0.136</td>
<td>0.147</td>
<td>0.0000055340</td>
<td>0.0000055340</td>
<td>0.03 - 0.34 1.44 0.45 - 0.18 0.00 - 0.16</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A3</td>
<td>7</td>
<td>0.449</td>
<td>0.04</td>
<td>0.692</td>
<td>0.145</td>
<td>0.535</td>
<td>0.136</td>
<td>0.147</td>
<td>0.0000055340</td>
<td>0.0000055340</td>
<td>0.09 - 0.10 1.21 0.28 - 0.23 0.58 - 0.07</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A4</td>
<td>7</td>
<td>0.254</td>
<td>0.04</td>
<td>0.842</td>
<td>0.145</td>
<td>0.535</td>
<td>0.136</td>
<td>0.147</td>
<td>0.0000055340</td>
<td>0.0000055340</td>
<td>0.02 0.34 - 0.63 - 0.11 0.72 3.85 0.01</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: The table continues with similar data for each soil group A2, A3, and A4, showing measured and model results for various properties including CEC, Na, Cl, LL, PL, c, φ, CBR, PC, SP, ΔL, Δδ, ΔC, ΔCBR, ΔPC, ΔSP, and % Diff btw measured and model results.
<table>
<thead>
<tr>
<th>Soil</th>
<th>Measured soil chemical and geotechnical properties</th>
<th>Model geotechnical properties</th>
<th>% Diff btw measured and model results</th>
</tr>
</thead>
<tbody>
<tr>
<td>B1</td>
<td>40.02 18.1 39.84 15.9 16.3 10.63 20.35 3.26 3.85 21.93 39.84 15.9 10.63 0.00000576 2.36 3.85 21.93 39.84 15.9 10.63</td>
<td>40.02 18.1 39.84 15.9 16.3 10.63 20.35 3.26 3.85 21.93 39.84 15.9 10.63</td>
<td>0.33 0.41 0.31 0.03 0.01 0.02 0.01 0.02 0.03 0.01 0.02 0.01 0.03 0.01 0.02 0.01 0.03 0.01 0.02 0.01</td>
</tr>
<tr>
<td>B3</td>
<td>40.04 18.2 36.29 14.6 31.1 16.3 24.3 3.14 3.94 20.26 36.29 14.6 31.1 0.00000439 2.14 3.94 20.26 36.29 14.6 31.1</td>
<td>40.04 18.2 36.29 14.6 31.1 16.3 24.3 3.14 3.94 20.26 36.29 14.6 31.1</td>
<td>0.33 0.41 0.31 0.03 0.01 0.02 0.01 0.02 0.03 0.01 0.02 0.01 0.03 0.01 0.02 0.01 0.03 0.01 0.02 0.01</td>
</tr>
<tr>
<td>B3</td>
<td>40.06 18.3 36.29 14.6 31.1 16.3 24.3 3.14 3.94 20.26 36.29 14.6 31.1 0.00000439 2.14 3.94 20.26 36.29 14.6 31.1</td>
<td>40.06 18.3 36.29 14.6 31.1 16.3 24.3 3.14 3.94 20.26 36.29 14.6 31.1</td>
<td>0.33 0.41 0.31 0.03 0.01 0.02 0.01 0.02 0.03 0.01 0.02 0.01 0.03 0.01 0.02 0.01 0.03 0.01 0.02 0.01</td>
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</tbody>
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