TABLE 1A: ALB associated changes in Diabetic and Non Diabetic Experiments when Extracts were administered to Different Groups

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  | **ALB DIABETIC** | |  |
| **Diabetic** | **WK1** | **WK2** | **WK3** | **WK4** |
| **CTRL** | 36.43 ± 0.44 | 39.2 ± 0.54 | 34.65 ± 1.57 | 35.24 ± 3.54 |
| **Untreated** | 22.37 ± 2.05 | 25.15 ± 2.48 | 27.92 ± 1.08 | 27.52 ± 2.56 |
| **Orange** | 34.25 ± 3.47 | 39.4 ± 0.83 | 41.18 ± 1.13 | 41.38 ± 1.08 |
| **Lemon** | 22.37 ± 2.05 | 32.08 ± 4.73 | 33.26 ± 4.24 | 37.03 ± 2.28 |
| **Grape** | 22.97 ± 1.47 | 34.65 ± 2.1 | 30.29 ± 2.48 | 37.82 ± 4.45 |
| **Lime** | 21.19 ± 0.89 | 31.68 ± 3.05 | 35.84 ± 1.90 | 38.02 ± 1.66 |
| **Tangerine** | 23.76 ± 0.99 | 28.51 ± 0.83 | 31.09 ± 2.05 | 40.99 ± 1.66 |
| **Combination** | 25.15 ± 1.13 | 31.09 ± 2.58 | 34.06 ± 2.85 | 40.39 ± 3.66 |

Across the weeks, all the experimental groups showed increased levels of albumin between the first and the second week of the experiment. The treatment groups of lemon, grape and lime showed the greatest significant (p < 0.05) increases from 22.37, 22.97 and 21.19 to 32.08, 34.65 and 31.68 respectively. This trend however, did not continue for the control group as the albumin levels for the remaining weeks did not significantly differ from the week 1. The untreated group showed the lowest levels of albumin concentration at week 4, (22.52) which were significantly lower than every other experimental group (p < 0.05).

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **ALBUMIN g/L NON-DIABETIC** | |  |  |
| **Non Diabetic** | **WK1** | **WK2** | **WK3** | **WK4** |
| **CTRL** | 37.62 ± 2.97 | 38.21 ± 0.89 | 38.02 ±1.8 | 33.86 ± 2.47 |
| **Untreated** | 21.78 ± 1.21 | 25.15 ± 2.05 | 30.1 ± 2.28 | 30.29 ± 1.8 |
| **Orange** | 33.86 ± 3.08 | 39.80 ± 0.83 | 42.77 ± 1.63 | 45.94 ± 2.05 |
| **Lemon** | 33.07 ± 1.13 | 37.82 ± 1.08 | 47.72 ± 1.77 | 46.13 ± 0.89 |
| **Grape** | 33.26 ± 1.93 | 40.59 ± 4.02 | 54.46 ± 2.21 | 53.07 ± 1.50 |
| **Lime** | 32.87 ± 1.08 | 36.83 ± 1.77 | 48.12 ± 2.06 | 48.31 ± 1.30 |
| **Tangerine** | 33.26 ± 2.17 | 36.83 ± 1.77 | 47.52 ± 1.21 | 49.31 ± 1.63 |
| **Combination** | 30.29 ± 0.54 | 35.64 ± 0.70 | 47.12 ± 1.13 | 48.91 ± 0.89 |

The control groups showed consistent levels of albumin across the weeks with a significantly (p < 0.05) decreased level at week 4 (33.86g/dl). The untreated group however showed significantly increased levels of albumin with weeks 1 and 4 showing 21.78g/L and 30..29g/L respectively. Albumin levels within the groups for each week also showed significant increases compared to the untreated group.

**TABLE 1B: AST associated changes in Diabetic and Non Diabetic Experiments when Extracts were administered to Different Groups**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  | **AST u/L DIABETIC** | |  |
| Diabetic | **WK1** | **WK2** | **WK3** | **WK4** |
| **CTRL** | 87.33 ± 1.08 | 85.55 ± 1.33 | 88.52 ± 4.46 | 83.57 ± 0.54 |
| **Untreated** | 143.76 ± 6.59 | 151.68 ± 5.92 | 160.00 ± 1.66 | 155.45 ± 0.99 |
| **Orange** | 143.76 ± 8.67 | 148.12 ± 4.68 | 160.00 ± 2.48 | 155.25 ± 0.83 |
| **Lemon** | 128.71 ± 2.42 | 126.73 ± 4.20 | 124.95 ± 12.41 | 90.69 ± 2.76 |
| **Grape** | 127.72 ± 2.8 | 125.34 ± 1.13 | 105.94 ± 2.32 | 91.29 ± 3.24 |
| **Lime** | 125.34 ± 1.13 | 130.49 ± 2.92 | 109.31 ± 5.17 | 90.89 ± 4.17 |
| **Tangerine** | 130.49 ± 7.84 | 121.78 ± 1.21 | 104.36 ± 3.87 | 90.69 ± 4.12 |
| **Combination** | 129.3 ± 10.81 | 128.51 ± 1.90 | 102.57 ± 3.40 | 112.08 ± 3.00 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **AST u/L NON-DIABETIC** | |  |  |
| **Non Diabetic** | **WK1** | **WK2** | **WK3** | **WK4** |
| **CTRL** | 89.6 ± 2.36 | 83.92 ± 0.54 | 88.82 ± 2.46 | 80.18 ± 1.61 |
| **Untreated** | 128.03 ± 2.99 | 136.85 ± 4.25 | 134.30 ± 3.73 | 143.12 ± 3.18 |
| **Orange** | 119.4 ± 2.12 | 107.83 ± 7.97 | 81.95 ± 3.71 | 92.54 ± 3.29 |
| **Lemon** | 116.46 ± 3.7 | 98.23 ± 3.69 | 85.68 ± 3.30 | 80.97 ± 1.78 |
| **Grape** | 120.78 ± 2.44 | 110.97 ± 10.5 | 87.25 ± 2.40 | 80.58 ± 2.24 |
| **Lime** | 117.05 ± 2.65 | 110.38 ± 10.39 | 89.80 ± 2.36 | 90.97 ± 2.54 |
| **Tangerine** | 125.48 ± 2.08 | 110.19 ± 11.11 | 84.11 ± 4.41 | 83.72 ± 2.91 |
| **Combination** | 109.4 ± 2.26 | 107.63 ± 3.76 | 103.72 ± 8.47 | 88.62 ± 6.34 |

The untreated groups had AST levels that were significantly elevated in week 4 (143.12 u/L) compared to week 1 (128.03 u/L). This was also

**TABLE 1C: ALT associated changes in Diabetic and Non Diabetic Experiments when Extracts were administered to Different Groups**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  | **ALT u/L DIABETIC** | |  |
| **Diabetic** | **WK1** | **WK2** | **WK3** | **WK4** |
| **CTRL** | 33.26 ± 1.66 | 40.39 ± 2.36 | 37.62 ± 4.8 | 33.26 ± 1.13 |
| **Untreated** | 39.4 ± 1.47 | 38.02 ± 2.76 | 39.80 ± 4.5 | 48.91 ± 5.27 |
| **Orange** | 40 ± 4.46 | 42.57 ± 5.47 | 38.41 ± 5.75 | 33.46 ± 1.08 |
| **Lemon** | 38.81 ± 1.08 | 46.73 ± 2.03 | 37.82 ± 2.92 | 34.85 ± 7.05 |
| **Grape** | 43.56 ± 0.7 | 47.33 ± 9.69 | 39.4 ± 4.61 | 31.88 ± 2.15 |
| **Lime** | 49.31 ± 3.67 | 44.35 ± 7.43 | 39.01 ± 4.68 | 31.09 ± 1.50 |
| **Tangerine** | 50.89 ± 1.51 | 49.11 ± 8.00 | 43.96 ± 2.58 | 36.43 ± 0.83 |
| **Combination** | 51.09 ± 1.33 | 52.87 ± 2.86 | 40.79 ± 3.24 | 32.47 ± 6.16 |

The control group showed significantly (P < 0.05) elevated ALT levels in week 2 (40.39 u/L) compared to week 1 (33.26 u/L) but showed no significant difference for weeks 3 and 4. The untreated group showed significantly elevated enzyme levels (48.91 u/L) in week 4 compared to week 1 (39.4 u/L). All other experimental groups showed significantly decreasing levels of ALT across the weeks when compared to week 1. At the 4th week comparison within the treatment groups down the column showed ALT levels which did not significantly differ from the control group at 33.26 u/L. This is in exception to the untreated experimental group which showed the highest ALT enzyme levels.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **ALT u/L NON-DIABETIC** | |  |  |
| **Non Diabetic** | **WK1** | **WK2** | **WK3** | **WK4** |
| **CTRL** | 32.27 ± 1.50 | 39.6 ± 2.89 | 40.99 ± 3.40 | 32.87 ± 1.29 |
| **Untreated** | 40.00 ± 1.66 | 38.81 ± 4.45 | 45.34 ± 1.90 | 46.33 ± 4.23 |
| **Orange** | 39.20 ± 2.05 | 45.14 ± 4.29 | 35.44 ± 1.90 | 37.42 ± 7.96 |
| **Lemon** | 44.15 ± 0.54 | 37.82 ± 2.56 | 34.45 ± 2.03 | 27.52 ± 2.15 |
| **Grape** | 51.88 ± 2.06 | 45.94 ± 8.25 | 33.46 ± 5.12 | 28.31 ± 1.13 |
| **Lime** | 49.11 ± 6.74 | 47.32 ± 5.53 | 34.65 ± 2.89 | 33.86 ± 2.26 |
| **Tangerine** | 41.18 ± 3.18 | 46.93 ± 1.13 | 31.28 ± 3.74 | 35.24 ± 2.48 |
| **Combination** | 44.35 ± 2.92 | 49.70 ± 6.00 | 29.50 ± 1.29 | 32.08 ± 3.40 |

The ALT levels for the control group showed significantly increased levels at week 2 (39.60) and week 3 (40.99)

**TABLE 2A: UREA associated changes in Diabetic and Non Diabetic Experiments when Extracts were administered to Different Groups**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  | **UREA DIABETIC** | |  |
| **Diabetic** | **WK1** | **WK2** | **WK3** | **WK4** |
| **CTRL** | 15.84 ± 1.21 | 16.83 ± 0.7 | 16.43 ± 1.66 | 18.61 ± 1.77 |
| **Untreated** | 27.13 ± 0.89 | 29.5 ± 1.47 | 35.44 ± 2.56 | 33.26 ± 1.50 |
| **Orange** | 28.51 ± 0.44 | 25.34 ± 1.8 | 29.11 ± 2.05 | 26.53 ± 3.86 |
| **Lemon** | 31.09 ± 5.58 | 26.93 ± 1.29 | 17.82 ± 4.32 | 21.19 ± 1.13 |
| **Grape** | 24.95 ± 1.63 | 26.33 ± 1.5 | 18.81 ± 2.89 | 22.37 ± 4.00 |
| **Lime** | 31.48 ± 3.86 | 26.73 ± 0.7 | 19.21 ± 2.17 | 17.62 ± 3.6 |
| **Tangerine** | 32.47 ± 1.9 | 29.11 ± 1.33 | 18.41 ± 1.8 | 15.84 ± 0.99 |
| **Combination** | 28.91 ± 1.9 | 29.11 ± 1.13 | 21.98 ± 2.47 | 14.26 ± 0.54 |

The control group had urea levels as 15.84 at week 1 which was significantly (p < 0.05) lower than all the other experimental groups. Across the weeks, the urea level for the control group was consistent and although week 4 had slightly elevated urea levels (18.61), it did not differ significantly from the prior weeks. The untreated group was observed to show increasing levels of urea across the weeks which differed significantly at week 4 (33.26) from week 1 (27.13). This is in contrast to the remaining treatment groups which indicated significantly (p < 0.05) decreasing urea levels across the weeks. The combination treatment group showed the greatest difference from levels at 28.91 at week 1 to 14.26 at week 4.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **UREA NON-DIABETIC** | |  |  |
| **Non Diabetic** | **WK1** | **WK2** | **WK3** | **WK4** |
| **CTRL** | 15.84 ± 1.21 | 16.83 ± 0.7 | 16.43 ± 1.66 | 18.61 ± 1.77 |
| **Untreated** | 27.92 ± 1.08 | 23.76 ± 2.52 | 29.5 ± 1.29 | 29.11 ± 1.5 |
| **Orange** | 25.34 ± 2.38 | 23.96 ± 1.77 | 15.84 ± 3.28 | 20.2 ± 2.17 |
| **Lemon** | 26.33 ± 1.13 | 26.73 ± 1.21 | 16.83 ± 1.57 | 16.43 ± 0.89 |
| **Grape** | 25.94 ± 1.47 | 25.34 ± 1.5 | 16.24 ± 1.93 | 15.84 ± 1.21 |
| **Lime** | 33.86 ± 4.11 | 30.69 ± 1.85 | 18.41 ± 1.66 | 16.24 ± 1.66 |
| **Tangerine** | 31.88 ± 1.77 | 26.93 ± 0.83 | 22.37 ± 4.35 | 15.25 ± 1.13 |
| **Combination** | 24.95 ± 2.15 | 27.52 ± 1.48 | 19.6 ± 1.77 | 15.05 ± 1.29 |

**TABLE 2B: CREAT associated changes in Diabetic and Non Diabetic Experiments when Extracts were administered to Different Groups**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  | **CREATININE DIABETIC** | |  |
|  | **Week 1** | **Week 2** | **Week 3** | **Week 4** |
| **CTRL** | 20.86 ±1.68 | 22.17 ± 0.92 | 21.65 ± 2.18 | 24.52 ± 2.34 |
| **Untreated** | 68.5 ± 2.24 | 74.50 ± 3.71 | 89.50 ± 6.47 | 84 ± 3.79 |
| **Orange** | 72.00 ± 1.12 | 62.50 ± 5.00 | 77.50 ± 5.86 | 70.50 ± 9.59 |
| **Lemon** | 74.50 ± 13.04 | 67.00 ± 3.26 | 46.00 ±8.59 | 50.00 ± 4.68 |
| **Grape** | 67.50 ± 3.54 | 67.00 ± 3.26 | 49.5±7.79 | 47.00 ± 7.16 |
| **Lime** | 82.50 ± 6.61 | 66.00 ± 2.85 | 45.00 ± 4.68 | 44.00 ± 6.02 |
| **Tangerine** | 80.50 ± 7.58 | 74.00 ± 3.35 | 47.00 ±7.79 | 38.00 ± 1.12 |
| **Combination** | 73.5±5.48 | 75.00 ± 3.54 | 53.00 ± 6.94 | 35.50 ± 1.12 |

Creatinine level in the control group was lowest at week 1 and slightly elevated at week 4 but was not significantly different with the levels at 20.86 and 24.52 respectively. The untreated group showed significantly higher levels of creatinine compared to the control groups with the untreated group range between 68.50 and 89.0. The experimental treatment groups showed a consistently significant decrease of creatinine levels across the weeks. The tangerine treatment groups showed greatest decrease in creatinine levels from 8.50 in week 1 to 38.99 in week 4.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **CREATININE(µmol/L) NON-DIABETIC** | |  |  |
| **GROUPS** | **WK1** | **WK2** | **WK3** | **WK4** |
| **CTRL** | 20.8 ± 1.59 | 22.1 ± 0.92 | 21.58 ± 2.18 | 24.44 ± 2.33 |
| **Untreated** | 36.14 ± 1.09 | 32.5 ±3.79 | 37.7 ± 2.06 | 40.56 ± 2.14 |
| **Orange** | 31.2 ± 2.91 | 31.72 ± 3.51 | 24.18 ± 1.48 | 18.98 ± 6.07 |
| **Lemon** | 33.28 ± 2.18 | 34.58 ± 1.97 | 25.48 ± 2.53 | 20.28 ± 1.16 |
| **Grape** | 31.72 ± 1.48 | 35.36 ± 1.09 | 27.3 ± 2.43 | 20.54 ± 2.14 |
| **Lime** | 43.94 ± 3.72 | 40.3 ± 2.06 | 21.58 ± 2.7 | 21.32 ± 1.97 |
| **Tangerine** | 39.26 ± 3.61 | 35.36 ± 1.09 | 29.12± 7.21 | 19.24 ± 1.09 |
| **Combination** | 34.58 ± 1.97 | 33.8 ± 2.06 | 22.36 ± 2.14 | 20.28 ± 1.16 |

The creatinine levels for the control group across the four weeks did not show any significant (p < 0.05) change. The creatinine levels varied from 20.80 µmol/L at week 1 as the minimum to 24.44 µmol/L at week four as the maximum. All treatment groups showed decreasing creatinine concentration levels across the weeks. At week 4, comparison of the creatinine levels within the groups showed significantly (p < 0.05) decreased levels against the untreated group which had an average value of 40.56 µmol/L. Comparison with the control group however showed only tangerine and orange levels as significantly (p < 0.05) lower.