CHAPTER - 4

RESULTS
RESULTS

Results of the experiment entitled “Studies of the nutritive values of the wild seasonal fruits of Manipur” performed with the parameters of pH, moisture, vitamin C, antioxidant activity, protein, total soluble sugar, reducing sugar, non-reducing sugar, macro-elements and microelements are presented below under appropriate sub-headings with their findings.

pH values

The data for the mean pH level of all the fruit samples are presented in Table 4.1. The pH levels of Prunus triflora var. applemix, Antidesma bunius, Prunus triflora var. mangomix, Phyllanthus emblica, Averrhoa carambola, Prunus triflora var. kalenheikha, Punica granatum, Calamus latifolius, Citrus species (phouheiri) and Elaeocarpus floribundus were observed as 2.02, 2.04, 2.13, 2.14, 2.36, 2.5, 2.6, 2.75, 2.80 and 2.90 respectively. While same pH level was recorded in Prunus persica and Prunus armeniaca having 3.08. A medium level of pH in Docynia indica, Zizyphus mauritiana, Prunus triflora var. maoheikha, Spondias pinnata, Citrus medica and Elaeagnus pyriformis having 3.25, 3.29, 3.84, 3.92, 3.93 and 3.96 can be observed in fig.4.15. A pH value having 4.74 and 4.07 was observed in Hodgsonia macrocarpa and Pyrus communis.
The result for significant difference in pH values of twenty wild fruit samples are presented in fig. 4.1 in Pairwise matrix. Here the sample showing the (*) mark among the samples are significant at p< 0.05 level.

**Moisture content**

Moisture mean content of all the fruit samples are depicted in Table 4.2. From the data revealed significant variations of moisture content in the fruit samples ranging from 72.18 to 92.20% in fig. 4.16. The maximum moisture content was recorded as 92.20% and 90.80% in *Averrhoa carambola* and *Citrus species* (Phouheiri). Low moisture content was observed in *Hodgsonia macrocarpa*. In samples like *Prunus persica*, *Prunus triflora* var. mangomix, *Prunus triflora* var. kalenhsikha, *Prunus triflora* var. applemix, *Pyrus communis* and *Prunus triflora* var. maoheikha moisture content are found to be 89.07%, 89.08%, 87.21%, 87.54%, 87.21%, 87.29% and 87.71% respectively. Moisture content of fruit samples *Zizyphus mauritiana*, *Docynia indica*, *Elaeagnus pyriformis*, *Phyllanthus emblica*, *Prunus armeniaca*, *Elaeocarpus floribundus* and *Calamus latifolius* range from 80.31% to 85.14%. A similar moisture content was observed in *Spondias pinnata*, *Punica granatum* having 77.23% and 77.79% and 79.18% in *Antidesma bunius*. 
The result for significant difference of moisture content among the fruit samples are presented in Pairwise matrix (fig.4.2). Here the sample showing (*) mark in the samples are significant at p<0.05 level.

Vitamin C (Ascorbic acid) content

The mean vitamin C or Ascorbic acid content among the samples are presented in Table 4.3. and graphically depicted in fig.4.17. The maximum ascorbic acid content was found in *Phyllanthus emblica* having 375.68 mg/100g of fresh weight, followed by *Spondias pinnata*, *Citrus species* (phouheiri) and *Elaeagnus pyriformis* having 86.16mg/100g, 36.33mg/100g and 20.10mg/100g of fresh weight respectively, while other fruit samples *Calamus latifolius*, *Averrhoa carambola*, *Elaeocarpus floribundus*, *Punica granatum*, *Docynia indica*, *Prunus triflora* var. maoheikha, *Hodgsonia macrocarpa*, *Prunus triflora* var. kalenheikha, *Citrus medica*, *Zizyphus mauritiana*, *Pyrus communis*, *Prunus persica*, *Prunus triflora* var. applemix and *Antidesma bunius* range from 17.63 to 7.80mg/100g fresh weight. The lowest vitamin C content was found in *Prunus armeniaca* having 6.91mg/100g.

Antioxidant activity

Table 4.4 represents the mean antioxidant activity of all the wild fruit sample found in Manipur. The maximum antioxidant activity was
observed in *Phyllanthus emblica* having 181.21µg/ml followed by *Punica granatum*, *Spondias pinnata* and *Calamus latifolius* having 398.54µg/ml, 518.77µg/ml and 584.24µg/ml respectively. Wild fruits *Prunus triflora* var. maoheikha, *Prunus armeniaca*, *Elaeagnus pyriformis* and *Prunus persica* also show antioxidant activities having 666.64µg/ml, 755.26µg/ml, 867.84µg/ml and 910.34µg/ml respectively in fig.4.18 Remaining samples *Averrhoa carambola*, *Prunus triflora* var. applemix, *Prunus triflora* var. kalenheikha, *Zizyphus mauritian*, *Prunus triflora* var. mangomix, *Elaeocarpus floribundus*, *Pyrus communis*, *Docynia indica* and *Antidesma bunius* show antioxidant activity having 1179.96µg/ml, 1147.24µg/ml, 1192.83µg/ml, 1378.33µg/ml, 1379.73µg/ml, 1393.41µg/ml, 1557.09µg/ml, 1657.28µg/ml and 1717.43µg/ml respectively. Minimum antioxidant activity was observed in *Hodgsonia macrocarpa* having 2717.46µg/ml.

The result for significant difference of antioxidant activities in the samples are presented in Pairwise matrix (fig.4.3). Here the sample showing (*) mark among the samples are significant at p<0.05 level.

**Phosphate buffer soluble Protein**

From the results (Table.4.5. and fig. 4.19) reveals that there was a wide variation in the buffer soluble protein content of the wild fruit samples. Soluble protein content of the studied wild fruit ranged from
1.64 to 27.14mg/100g. Maximum soluble protein content was observed in *Phyllanthus emblica* having 27.14mg/100g followed by *Spondias pinnata* and *Hodgsonia macrocarpa* having 18.92mg/100g and 8.63 mg/100g respectively. Fruits like *Citrus medica*, *Prunus persica* and *Prunus armeniaca* show soluble protein contents having 7.25mg/100g, 7.17mg/100g and 6.07mg/100g respectively while *Prunus triflora* var. mangomix, *Calamus latifolius*, *Pyrus communis*, *Citrus species* (phouheiri), *Prunus triflora* var. kalenheikha, *Elaeagnus pyriformis*, *Prunus triflora* var. maoheikha protein range from 3.41 to 5.66mg/100g respectively. Protein content was found to be same in *Punica granatum* and *Prunus triflora* var. applemix with 5.54mg/100g. Low soluble protein content was observed in fruit samples *Elaeocarpus floribundus*, *Zizyphus mauritiana*, *Docynia indica* and *Averrhoa carambola* ranging from 1.81 to 2.76 mg/100g. Minimum protein was found in *Antidesma bunius* having 1.64 mg/100gm.

The result for significant difference of protein content among the fruit samples are presented in Pairwise matrix (fig.4.4). Here the sample showing (*) mark in the samples are significant at p<0.05 level.

**Total Soluble Sugar content.**

Result for mean total soluble sugar content are presented in Table 4.6. Total soluble sugar was found maximum in *Punica granatum* having (34.88mg/100g) followed by *Prunus triflora* var. maoheikha
34.62mg/100g, *Elaeagnus pyriformis* (33.93mg/100g) and *Prunus triflora* var. applemix (33.90mg/100g). *Citrus medica, Prunus persica, Pyrus communis, Docynia indica, Phyllanthus emblica* and *Zizyphus mauritiana* as depicted in fig. 4.20 show mean total soluble sugar content having 26.78mg/100g, 26.0mg/100g, 25.74mg/100g, 21.92mg/100g, 21.48mg/100g and 19.96mg/100g respectively. Low amount of total sugar were observed in *Elaeocarpus floribundus* (13.35mg/100g), *Citrus species* (phouheiri) (11.27mg/100g), *Prunus triflora* var. mangomix (8.73mg/100g), *Averrhoa carambola* (7.86mg/100g), *Prunus armeniaca* (7.42mg/100g), *Prunus triflora* var. kalenheikha (6.62mg/100g), *Spondias pinnata* (4.34mg/100g), *Hodgsonia macrocarpa* (1.35mg/100g), *Calamus latifolius* (1.73mg/100g) and *Antidesma bunius* having 1.21mg/100g being the lowest total soluble sugar from among the samples.

The result for significant difference of total soluble sugar content among the samples are presented in Pairwise matrix (fig. 4.5). Here the sample showing (*) mark in the samples are significant at \( p<0.05 \) level.

**Reducing Sugar**

The mean reducing sugar is presented in Table 4.7 and graphically in fig.4.21. Reducing sugar content in the wild seasonal
fruit varied widely. Maximum reducing sugar was recorded as 28.06mg/100g in *Punica granatum* followed by *Prunus triflora* var. maohiheka with 25.83mg/100g, *Phyllanthus emblica* 19.82mg/100g *Pyrus communis* 18.35mg/100g, *Prunus triflora* var. applemix 17.48mg/100g and *Elaegnus pyriformis* 17.83mg/100g. Sample *Zizyphus mauritiana, Citrus medica, Citrus species* (phouheiri) show 13.45mg/100g, 9.77mg/100g and 6.25mg/100g of reducing sugar content and *Prunus triflora* var. mangomix, *Prunus armeniaca, Prunus persica, Averrhoa carambola, Docynia indica, Elaeocarpus floribundus, Spondias pinnata, Calamus latifolius, Prunus triflora* var. kalenheikha range from 1.05 to 4.31mg/100g. Low reducing sugar content was observed in *Antidesma bunius* with 0.22mg/100g next higher *Hodgsonia macrocarpa* with 0.53mg/100g.

The result for significant difference of Reducing sugar content among the fruit samples are presented in Pairwise matrix (fig.4.6). Here the sample showing (*) mark in the samples are significant at p<0.05 level.

**Non-reducing sugar**

Data for non-reducing sugar is presented in Table 4.8. From the observation, it was found that mean non-reducing sugar content of the fruit samples ranged from 0.57 to 22.33mg/100g, as depicted in
Maximum non-reducing sugar content was observed in *Prunus persica* (22.33mg/100gm) followed by *Docynia indica*, *Citrus medica*, *Prunus triflora* var. applemix, *Elaeagnus pyriformis* and *Elaeocarpus floribundus* with 19.14mg/100g, 17.01mg/100g, 16.43mg/100g, 16.10mg/100g and 10.53mg/100g respectively. Fruit samples *Prunus triflora* var. maoheikha, *Pyrus communis*, *Punica granatum*, *Zizyphus mauritiana*, *Citrus species* (phouheiri), *Prunus triflora* var. kalenheikha, *Averrhoa carambola* and *Prunus triflora* var. mangomix have non-reducing sugar 8.78mg/100g, 7.40mg/100g, 7.04mg/100g, 6.51mg/100g, 5.02mg/100g, 5.58mg/100g, 4.82mg/100g and 4.43mg/100g respectively. Low content of non-reducing sugar was observed in *Prunus armeniaca* (3.53mg/100g), *Spondias pinnata* (2.89mg/100g), *Phyllanthus emblica* (1.63mg/100g), *Antidesma bunius* (0.99mg/100g) and *Hodgsonia macrocarpa* (0.81mg/100g). Minimum non-reducing sugar content was observed in *Calamus latifolius* with 0.57mg/100g.

The result for significant levels of non-reducing sugar content among the samples are presented in Pairwise matrix (fig.4.7). Here the sample showing (*) mark in the samples are significant at p<0.05 level.
MACROELEMENTS

Potassium

Table 4.9 represents mean potassium content in the studied fruit sample. From the analysis Potassium content was recorded maximum in *Hodgsonia macrocarpa* (650mg/100gm) followed by *Prunus triflora* var. kalenheikha, *Calamus latifolius*, *Antidesma bunius* and *Spondias pinnata* as 550mg/100g, 500mg/100g and 450mg/100g respectively. Wild fruits *Elaeocarpus floribundus*, *Punica granatum*, *Prunus armeniaca*, *Phyllanthus emblica*, *Prunus triflora* var. mangomix, *Prunus triflora* var. applemix and *Elaeagnus pyriformis* have 400mg/100g, 390mg/100g, 380mg/100g, 310mg/100g, 290mg/100g, 280mg/100g and 240mg/100g respectively of K content was depicted graphically in fig.4.23. Low K content was recorded as 200mg/100g, 160mg/100g, 140mg/100g, 130mg/100g in *Zizyphus mauritiana*, *Prunus persica*, *Citrus species* (phouheiri), *Pyrus communis*, *Docynia indica* and *Prunus triflora* var. maoheikha. Minimum K content of 60mg/100g was recorded in *Citrus medica*.

The result for significant difference of K content among the samples are presented in Pairwise matrix (fig.4.8). Here the sample showing (*) mark in the samples are significant at p<0.05 level.
Magnesium

Data for mean magnesium content in the fruit samples of twenty wild seasonal fruits are presented in Table 4.9. From the examination of the results (fig.4.24) revealed that there was a wide variation in the Mg content. The Mg content was found to be highest in *Antidesma bunius* having 193.25mg/100g and lowest in *Spondias piñnata* containing 4.18mg/100g. Fruit samples *Hodgsonia macrocarpa* and *Prunus triflora* var. kalenheikha also have reasonable amount of Mg content having 93.5mg/100g and 63.8mg/100g while other fruit samples *Elaeagnus pyriformis*, *Docynia indica*, *Prunus triflora* var. applemix and var. maoheikha, *Zizyphus mauritiana*, *Phyllanthus emblica* range from 12.7 to 27.50mg/100g Mg content and *Calamus latifolius*, *Pyrus communis*, *Averrhoa carambola*, *Elaeocarpus floribundus*, *Punica granatum*, *Citrus species* (phouheiri), *Citrus medica*, *Prunus triflora* var. mangomix range from 32 to 45.60mg/100g Mg content. Same amount of Mg content was observed in fruit samples *Prunus persica* and *Prunus armeniaca* with 36.15mg/100g.

The result for significant difference of Mg content among the wild fruit samples are presented in Pairwise matrix (fig.4.9). Here the sample showing (*) mark among the samples are significant at p<0.05 level.
MICROELEMENTS

Iron

Results on iron content in the fruit sample of twenty wild fruits are presented in Table 4.10 and graphically presented in fig.4.25. From the examination of the results revealed that there was a wide variation in the mean iron content. Iron was found to be maximum in *Calamus latifolius* having 32mg/100g followed by *Pyrus communis*, *Prunus armeniaca*, *Antidesma bunius* and *Zizyphus mauritiana* having 21.55mg/100g, 20.1mg/100g, 18.85mg/100g and 17.55mg/100g respectively. Iron content of fruit samples *Citrus species* (phouheiri), *Spondias pinnata*, *Citrus medica*, *Averrhoa carambola*, *Prunus persica*, *Elaeocarpus floribundus*, *Docynia indica* range from 12.8 to 15.2mg/100g while *Prunus triflora* var. maoheikha, *Phyllanthus emblica*, *Elaeagnus pyriformis*, *Punica granatum*, *Prunus triflora* var. applemix, *Hodgsonia macrocarpa*, *Prunus triflora* var. kalenheikha range from 9.05 to 11.8mg/100g respectively. Minimum Fe content was observed in *Prunus triflora* var. mangomix containing 8.4mg/100g.

The result for significant difference of Fe content among the samples are presented in Pairwise matrix (fig.4.10). Here the sample showing (*) mark among the samples are significant at p<0.05 level.
Copper

Data for mean copper content in the fruit samples are presented in Table 4.10. A little variation was observed in copper content which range from 0.85 to 2.6mg/100g. Maximum copper content was observed in fruit sample *Hogdsonia macrocarpa* (2.6mg/100g) and minimum in *Citrus species* (phouheiri) 0.86mg/100g as depicted in fig.4.26. Wild fruit samples *Prunus armeniaca, Prunus triflora* var. mangomix, *Citrus medica, Prunus triflora* var. maoheikha, *Phyllanthus emblica, Elaeagnus pyriformis, Zizyphus mauritiana* range from 1to1.25mg/100g of Cu content. *Elaeocarpus floribundus* and *Docynia indica* are found to have same amount of Cu content having 1.45 mg/100g, *Pyrus communi* and *Elaeagnus pyriformis* also have 1.3 mg/100g.

The result for significant difference of Cu content in the samples are presented in Pairwise matrix (fig.4.11). Here the sample showing (*) mark in the samples are significant at p<0.05 level.

Cobalt

Cobalt content in the twenty fruit samples are presented in Table 4.10 and graphically depicted in fig.4.27. From the investigation mean cobalt content of all the fruit samples range from 0.05 to 0.1mg /100g. Cobalt content of samples *Zizyphus mauritiana, Citrus medica,*
Phyllanthus emblica, Docynia indica, Hodgsonia macrocarpa, Prunus triflora var. kalenheikha, Prunus armeniaca, Punica granatum, Pyrus communis, Citrus species (phouheiri), Prunus triflora var. mangomix have same value of Co contents having 0.05mg/100g and Prunus persica, Elaeocarpus floribundus, Averrhoa carambola, Calamus latifolius, Antidesma bunius, Prunus triflora var. maoheikha having 0.1mg/100g of cobalt contents. Cobalt is found to be absent in fruit samples Spondias pinnata and Elaeagnus pyriformis.

The result for significant difference of Co content in the sample are presented in Pairwise matrix (Fig.4.12). There was no significant difference among the fruit samples in case of Co content.

Manganese

Table 4.10 represents manganese element in all the fruit samples. There is a wide variation in mean Mn content among the wild fruit samples. From the study, Mn was recorded highest in Antidesma bunius containing 21.8mg/100g. Fruits like Zizyphus mauritiana, Spondias pinnata and Prunus triflora var. maoheikha have same Mn content having 1.4mg/100g and 0.94mg/100g in Pyrus communis, Prunus armeniaca and Elaeagnus pyriformis are graphically shown in fig.4.28 Mn value of Docynia indica, Punica granatum, Prunus persica, Prunus triflora var. mangomix, Elaeocarpus floribundus, Calamus latifolius,
Hodgsonia macrocarpa, Prunus triflora var. kalenheikha, Prunus triflora var. applemix, Phyllanthus emblica, Averrhoa carambola range from 0.8 to 4.05mg/100g. The lowest Mn content is observed in Citrus species (phouheiri) containing 0.65mg/100g.

The result for significant difference of Mn content among the samples are presented in Pairwise matrix (fig.4.13). Here the sample showing (*) mark among the samples are significant at p<0.05 level.

Zinc

Zinc content in the twenty wild fruit samples are presented in Table 4.10 and graphically presented in fig.4.29. A little variation was observed in zinc mean content and ranges from 0.74 to 3.45mg/100g. Maximum zinc content was observed in fruit sample Prunus triflora having 3.45mg/100g followed by Hodgsonia macrocrapa (3.3mg/100g) and minimum in fruit sample Prunus triflora var. maoheikha having 0.74 mg/100g. Fruit sample Punica granatum, Pyrus communis have same amount of Zn value 1.8mg/100g and Elaeocarpus floribundus, Spondias pinnata, Docynia indica, Elaeagnus pyriformis also have same amount of Zn content 0.9mg/100g. Samples like Citrus species (phouheiri), Citrus medica, Prunus armeniaca, Zizyphus mauritiana, Prunus triflora var. applemix and var. mangomix,
Phyllanthus emblica, Calamus latifolius, Antidesma bunius, Prunus persica and Averrhoa carambola range from 0.8 to 2.7 mg/100g of Zn.

The result for significant difference of Zinc content in the samples are presented in Pairwise matrix (fig.4.14). Here the sample showing (*) mark in the samples are significant at p<0.05 level.

CORRELATION ANALYSIS BETWEEN VITAMIN C AND ANTIOXIDANT ACTIVITY (IC$_{50}$)

Pearson correlation coefficient is analysed between vitamin C and antioxidant activity (which is expressed in term of IC$_{50}$). The 'r' values between vitamin C and IC$_{50}$ content of Phyllanthus emblica, Spondias pinnata and Citrus species (phouheiri) are found to be -0.940, -0.924 and -0.915 respectively. It indicates that antioxidant activities in these fruits are highly correlated with vitamin C content (Table no. 4.11). On the other hand fruit samples of Elaeagnus pyriformis, Prunus armeniaca, Antidesma buinus, Elaeocarpus floribundus, Prunus persica and Punica granatum having 'r' values -0.896, -0.864, -0.726, -0.726, -0.703 and -0.704 respectively indicating high significant relationship. Fruit samples Zizyphus mauritiana, Averrhoa carambola and Pyrus communis having 'r' value -0.647, -0.580 and -0.522 respectively shows moderate significant relationship. Among the Prunus varieties, Prunus triflora var. kalenheikha, Prunus triflora var. maokehkha, Prunus triflora var. applemix and Prunus triflora var.
mangomix shows moderate correlation between vitamin C and IC$_{50}$. Chance of correlation may exist in *Docynia indica* and *Hodgsonia macrocarpa* having $r=-0.259$ and $r=-0.039$ respectively.
Table 4.1 Showing the pH value of all the fruit samples

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<th>Sl. No.</th>
<th>Name of the samples</th>
<th>pH value</th>
<th>S. D.</th>
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<td>1.</td>
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<td>Calamus latifolius</td>
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<td>Pyrus communis</td>
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<td>20.</td>
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Table 4.2 Showing the moisture content (%) of wild fruits of Manipur.

<table>
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<th>Sl. No.</th>
<th>Name of the samples</th>
<th>Moisture content(%)</th>
<th>S. D.</th>
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<tr>
<td>1.</td>
<td><em>Antidesma bunius</em></td>
<td>79.18</td>
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<td>92.20</td>
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<td><em>Citrus species (phouheiri)</em></td>
<td>90.80</td>
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<tr>
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<td><em>Elaeocarpus floribundus</em></td>
<td>84.80</td>
<td>0.09</td>
</tr>
<tr>
<td>9.</td>
<td><em>Hodgsonia macrocarpa</em></td>
<td>72.18</td>
<td>0.07</td>
</tr>
<tr>
<td>10.</td>
<td><em>Phyllanthus emblica</em></td>
<td>82.65</td>
<td>1.63</td>
</tr>
<tr>
<td>11.</td>
<td><em>Prunus armeniaca</em></td>
<td>84.45</td>
<td>0.11</td>
</tr>
<tr>
<td>12.</td>
<td><em>Prunus persica</em></td>
<td>89.08</td>
<td>0.28</td>
</tr>
<tr>
<td>13.</td>
<td><em>Prunus triflora</em> var. applemix</td>
<td>87.21</td>
<td>0.03</td>
</tr>
<tr>
<td>14.</td>
<td><em>Prunus triflora</em> var. kalenheikha</td>
<td>87.54</td>
<td>0.23</td>
</tr>
<tr>
<td>15.</td>
<td><em>Prunus triflora</em> var. mangomix</td>
<td>89.07</td>
<td>0.06</td>
</tr>
<tr>
<td>16.</td>
<td><em>Prunus triflora</em> var. maoheikha</td>
<td>87.71</td>
<td>0.04</td>
</tr>
<tr>
<td>17.</td>
<td><em>Punica granatum</em></td>
<td>77.79</td>
<td>1.11</td>
</tr>
<tr>
<td>18.</td>
<td><em>Pyrus communis</em></td>
<td>87.29</td>
<td>0.08</td>
</tr>
<tr>
<td>19.</td>
<td><em>Spondias pinnata</em></td>
<td>77.23</td>
<td>0.21</td>
</tr>
<tr>
<td>20.</td>
<td><em>Zizyphus mauritiana</em></td>
<td>80.31</td>
<td>0.33</td>
</tr>
</tbody>
</table>
Table 4.3 Showing the Vitamin C content (mg/100g) in fresh wt. basis of wild fruits of Manipur

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Name of the samples</th>
<th>Vitamin C (mg/100g)</th>
<th>S. D.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Antidesma bunius</td>
<td>7.80</td>
<td>2.15</td>
</tr>
<tr>
<td>2.</td>
<td>Averrhoa carambola</td>
<td>16.38</td>
<td>2.01</td>
</tr>
<tr>
<td>3.</td>
<td>Calamus latifolius</td>
<td>17.63</td>
<td>3.21</td>
</tr>
<tr>
<td>4.</td>
<td>Citrus medica</td>
<td>11.61</td>
<td>2.50</td>
</tr>
<tr>
<td>5.</td>
<td>Citrus species (phouheiri)</td>
<td>36.33</td>
<td>6.56</td>
</tr>
<tr>
<td>6.</td>
<td>Docynia indica</td>
<td>14.84</td>
<td>2.68</td>
</tr>
<tr>
<td>7.</td>
<td>Elaeagnus pyriformis</td>
<td>20.10</td>
<td>4.76</td>
</tr>
<tr>
<td>8.</td>
<td>Elaeocarpus floribundus</td>
<td>16.22</td>
<td>2.94</td>
</tr>
<tr>
<td>9.</td>
<td>Hodgsonia macrocarpa</td>
<td>13.21</td>
<td>1.79</td>
</tr>
<tr>
<td>10.</td>
<td>Phyllanthus emblica</td>
<td>375.68 *</td>
<td>110.64</td>
</tr>
<tr>
<td>11.</td>
<td>Prunus armeniaca</td>
<td>6.91</td>
<td>1.21</td>
</tr>
<tr>
<td>12.</td>
<td>Prunus persica</td>
<td>10.76</td>
<td>2.18</td>
</tr>
<tr>
<td>13.</td>
<td>Prunus triflora var. applemix</td>
<td>8.02</td>
<td>1.02</td>
</tr>
<tr>
<td>14.</td>
<td>Prunus triflora var. kalenheikha</td>
<td>13.18</td>
<td>1.37</td>
</tr>
<tr>
<td>15.</td>
<td>Prunus triflora var. mangomix</td>
<td>8.60</td>
<td>2.15</td>
</tr>
<tr>
<td>16.</td>
<td>Prunus triflora var. maoheikha</td>
<td>13.03</td>
<td>2.59</td>
</tr>
<tr>
<td>17.</td>
<td>Punica granatum</td>
<td>14.41</td>
<td>0.88</td>
</tr>
<tr>
<td>18.</td>
<td>Pyrus communis</td>
<td>10.34</td>
<td>2.53</td>
</tr>
<tr>
<td>19.</td>
<td>Spondias pinnata</td>
<td>86.16</td>
<td>11.04</td>
</tr>
<tr>
<td>20.</td>
<td>Zizyphus mauritiana</td>
<td>11.91</td>
<td>2.28</td>
</tr>
</tbody>
</table>

Note: Sample with (*) mark is highly significant at p<0.05 level.
Table 4.4 Showing the Antioxidant activity (IC$_{50}$$\mu$g/ml) in dry wt.basis of wild fruits of Manipur

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Name of the samples</th>
<th>Antioxidant activity IC$_{50}$$\mu$g/ml</th>
<th>S. D.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td><em>Antidesma bunius</em></td>
<td>1717.43</td>
<td>203.66</td>
</tr>
<tr>
<td>2.</td>
<td><em>Averrhoa carambola</em></td>
<td>1179.96</td>
<td>104.96</td>
</tr>
<tr>
<td>3.</td>
<td><em>Calamus latifolius</em></td>
<td>584.24</td>
<td>79.55</td>
</tr>
<tr>
<td>4.</td>
<td><em>Citrus medica</em></td>
<td>719.20</td>
<td>134.80</td>
</tr>
<tr>
<td>5.</td>
<td><em>Citrus species</em> (phouheiri)</td>
<td>1701.81</td>
<td>105.08</td>
</tr>
<tr>
<td>6.</td>
<td><em>Docynia indica</em></td>
<td>1657.28</td>
<td>867.09</td>
</tr>
<tr>
<td>7.</td>
<td><em>Elaeagnus pyriformis</em></td>
<td>867.84</td>
<td>175.24</td>
</tr>
<tr>
<td>8.</td>
<td><em>Elaeocarpus floribundus</em></td>
<td>1393.41</td>
<td>593.09</td>
</tr>
<tr>
<td>9.</td>
<td><em>Hodgsonia macrocarpa</em></td>
<td>2717.46</td>
<td>363.61</td>
</tr>
<tr>
<td>10.</td>
<td><em>Phyllanthus emblica</em></td>
<td>181.21</td>
<td>2.01</td>
</tr>
<tr>
<td>11.</td>
<td><em>Prunus armeniaca</em></td>
<td>755.26</td>
<td>45.67</td>
</tr>
<tr>
<td>12.</td>
<td><em>Prunus persica</em></td>
<td>910.34</td>
<td>100.28</td>
</tr>
<tr>
<td>13.</td>
<td><em>Prunus triflora</em> var. applemix</td>
<td>1147.24</td>
<td>121.24</td>
</tr>
<tr>
<td>14.</td>
<td><em>Prunus triflora</em> var. kalenheikha</td>
<td>1192.83</td>
<td>449.14</td>
</tr>
<tr>
<td>15.</td>
<td><em>Prunus triflora</em> var. mangomix</td>
<td>1379.73</td>
<td>427.13</td>
</tr>
<tr>
<td>16.</td>
<td><em>Prunus triflora</em> var. maoheikha</td>
<td>666.64</td>
<td>33.79</td>
</tr>
<tr>
<td>17.</td>
<td><em>Punica granatum</em></td>
<td>398.54</td>
<td>47.69</td>
</tr>
<tr>
<td>18.</td>
<td><em>Pyrus communis</em></td>
<td>1557.09</td>
<td>227.73</td>
</tr>
<tr>
<td>19.</td>
<td><em>Spondias pinnata</em></td>
<td>518.77</td>
<td>6.95</td>
</tr>
<tr>
<td>20.</td>
<td><em>Zizyphus mauritiana</em></td>
<td>1378.33</td>
<td>239.80</td>
</tr>
</tbody>
</table>
Table 4.5 Showing the protein content (mg/100g) in dry wt. basis of wild fruits of Manipur

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Name of the samples</th>
<th>Protein (mg/100g)</th>
<th>S. D.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Antidesma bunius</td>
<td>1.64</td>
<td>0.31</td>
</tr>
<tr>
<td>2.</td>
<td>Averrhoa carambola</td>
<td>2.13</td>
<td>0.39</td>
</tr>
<tr>
<td>3.</td>
<td>Calamus latifolius</td>
<td>3.52</td>
<td>0.24</td>
</tr>
<tr>
<td>4.</td>
<td>Citrus medica</td>
<td>7.25</td>
<td>0.23</td>
</tr>
<tr>
<td>5.</td>
<td>Citrus species (phouheiri)</td>
<td>3.93</td>
<td>0.32</td>
</tr>
<tr>
<td>6.</td>
<td>Docynia indica</td>
<td>2.64</td>
<td>0.31</td>
</tr>
<tr>
<td>7.</td>
<td>Elaeagnus pyriformis</td>
<td>5.28</td>
<td>0.13</td>
</tr>
<tr>
<td>8.</td>
<td>Elaeocarpus floribundus</td>
<td>1.81</td>
<td>0.06</td>
</tr>
<tr>
<td>9.</td>
<td>Hodgsonia macrocarpa</td>
<td>8.63</td>
<td>0.43</td>
</tr>
<tr>
<td>10.</td>
<td>Phyllanthus emblica</td>
<td>27.14</td>
<td>1.32</td>
</tr>
<tr>
<td>11.</td>
<td>Prunus armeniaca</td>
<td>6.07</td>
<td>0.22</td>
</tr>
<tr>
<td>12.</td>
<td>Prunus persica</td>
<td>7.17</td>
<td>0.16</td>
</tr>
<tr>
<td>13.</td>
<td>Prunus triflora var. applemix</td>
<td>5.54</td>
<td>0.87</td>
</tr>
<tr>
<td>14.</td>
<td>Prunus triflora var. kalenheikha</td>
<td>4.45</td>
<td>0.37</td>
</tr>
<tr>
<td>15.</td>
<td>Prunus triflora var. mangomix</td>
<td>3.41</td>
<td>0.10</td>
</tr>
<tr>
<td>16.</td>
<td>Prunus triflora var. maoheikha</td>
<td>5.66</td>
<td>0.33</td>
</tr>
<tr>
<td>17.</td>
<td>Punica granatum</td>
<td>5.54</td>
<td>0.86</td>
</tr>
<tr>
<td>18.</td>
<td>Pyrus communis</td>
<td>3.77</td>
<td>0.38</td>
</tr>
<tr>
<td>19.</td>
<td>Spondias pinnata</td>
<td>18.92</td>
<td>1.75</td>
</tr>
<tr>
<td>20.</td>
<td>Zizyphus mauritiana</td>
<td>2.76</td>
<td>0.42</td>
</tr>
</tbody>
</table>
Table 4.6 Showing the total soluble sugar content (mg/100g) in dry wt. basis of wild fruits of Manipur.

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Name of the samples</th>
<th>Total sugar (mg/100g)</th>
<th>S. D.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td><em>Antidesma bunius</em></td>
<td>1.21</td>
<td>0.12</td>
</tr>
<tr>
<td>2.</td>
<td><em>Averrhoa carambola</em></td>
<td>7.86</td>
<td>1.46</td>
</tr>
<tr>
<td>3.</td>
<td><em>Calamus latifolius</em></td>
<td>1.73</td>
<td>0.34</td>
</tr>
<tr>
<td>4.</td>
<td><em>Citrus medica</em></td>
<td>26.78</td>
<td>2.78</td>
</tr>
<tr>
<td>5.</td>
<td><em>Citrus species</em> (phouheiri)</td>
<td>11.27</td>
<td>1</td>
</tr>
<tr>
<td>7.</td>
<td><em>Elaeagnus pyriformis</em></td>
<td>33.92</td>
<td>2.88</td>
</tr>
<tr>
<td>8.</td>
<td><em>Elaeocarpus floribundus</em></td>
<td>13.45</td>
<td>1.16</td>
</tr>
<tr>
<td>9.</td>
<td><em>Hodgsonia macrocarpa</em></td>
<td>1.35</td>
<td>0.36</td>
</tr>
<tr>
<td>10.</td>
<td><em>Phyllanthus emblica</em></td>
<td>21.48</td>
<td>1.55</td>
</tr>
<tr>
<td>11.</td>
<td><em>Prunus armeniaca</em></td>
<td>7.42</td>
<td>1.97</td>
</tr>
<tr>
<td>12.</td>
<td><em>Prunus persica</em></td>
<td>26.00</td>
<td>3.05</td>
</tr>
<tr>
<td>13.</td>
<td><em>Prunus triflora</em> var. applemix</td>
<td>33.90</td>
<td>4.62</td>
</tr>
<tr>
<td>14.</td>
<td><em>Prunus triflora</em> var. kalenheikha</td>
<td>6.62</td>
<td>0.45</td>
</tr>
<tr>
<td>15.</td>
<td><em>Prunus triflora</em> var. mangomix</td>
<td>8.73</td>
<td>1.61</td>
</tr>
<tr>
<td>16.</td>
<td><em>Prunus triflora</em> var. maoheikha</td>
<td>34.61</td>
<td>2.66</td>
</tr>
<tr>
<td>17.</td>
<td><em>Punica granatum</em></td>
<td>34.88</td>
<td>2.25</td>
</tr>
<tr>
<td>18.</td>
<td><em>Pyrus communis</em></td>
<td>25.74</td>
<td>2.77</td>
</tr>
<tr>
<td>19.</td>
<td><em>Spondias pinnata</em></td>
<td>4.34</td>
<td>0.66</td>
</tr>
<tr>
<td>20.</td>
<td><em>Zizyphus mauritiana</em></td>
<td>19.96</td>
<td>1.32</td>
</tr>
</tbody>
</table>
Table 4.7  Showing the reducing sugar content (mg/100g) in dry wt. basis of wild fruits of Manipur.

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Name of the samples</th>
<th>Reducing sugar(mg/100g)</th>
<th>S. D.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Antidesma bunius</td>
<td>0.22</td>
<td>0.09</td>
</tr>
<tr>
<td>2.</td>
<td>Averrhoa carambola</td>
<td>3.10</td>
<td>1.52</td>
</tr>
<tr>
<td>3.</td>
<td>Calamus latifolius</td>
<td>1.17</td>
<td>0.34</td>
</tr>
<tr>
<td>4.</td>
<td>Citrus medica</td>
<td>9.77</td>
<td>1.39</td>
</tr>
<tr>
<td>5.</td>
<td>Citrus species (phouheiri)</td>
<td>6.25</td>
<td>1.36</td>
</tr>
<tr>
<td>6.</td>
<td>Docynia indica</td>
<td>2.78</td>
<td>1.57</td>
</tr>
<tr>
<td>7.</td>
<td>Elaeagnus pyriformis</td>
<td>17.83</td>
<td>1.72</td>
</tr>
<tr>
<td>8.</td>
<td>Elaeocarpus floribundus</td>
<td>2.92</td>
<td>0.6</td>
</tr>
<tr>
<td>9.</td>
<td>Hodgsonia macrocarpa</td>
<td>0.53</td>
<td>0.34</td>
</tr>
<tr>
<td>10.</td>
<td>Phyllanthus emblica</td>
<td>19.82</td>
<td>1.96</td>
</tr>
<tr>
<td>11.</td>
<td>Prunus armeniaca</td>
<td>3.89</td>
<td>1.86</td>
</tr>
<tr>
<td>12.</td>
<td>Prunus persica</td>
<td>3.67</td>
<td>1.36</td>
</tr>
<tr>
<td>13.</td>
<td>Prunus triflora var. applemix</td>
<td>17.48</td>
<td>4.23</td>
</tr>
<tr>
<td>14.</td>
<td>Prunus triflora var. kalenheikha</td>
<td>1.05</td>
<td>0.23</td>
</tr>
<tr>
<td>15.</td>
<td>Prunus triflora var. mangomix</td>
<td>4.31</td>
<td>1.66</td>
</tr>
<tr>
<td>16.</td>
<td>Prunus triflora var. maoheikha</td>
<td>25.83</td>
<td>3.69</td>
</tr>
<tr>
<td>17.</td>
<td>Punica granatum</td>
<td>28.06</td>
<td>3.1</td>
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<tr>
<td>18.</td>
<td>Pyrus communis</td>
<td>18.35</td>
<td>2.05</td>
</tr>
<tr>
<td>19.</td>
<td>Spondias pinnata</td>
<td>1.48</td>
<td>0.38</td>
</tr>
</tbody>
</table>
Table 4.8  Showing the Non-reducing sugar content  (mg/100g) in dry wt. basis of wild fruits of Manipur

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Name of the samples</th>
<th>Non-reducing sugar(mg/100g)</th>
<th>S. D.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Antidesma bunius</td>
<td>0.99</td>
<td>0.08</td>
</tr>
<tr>
<td>2.</td>
<td>Averrhoa carambola</td>
<td>4.82</td>
<td>2.24</td>
</tr>
<tr>
<td>3.</td>
<td>Calamus latifolius</td>
<td>0.57</td>
<td>0.33</td>
</tr>
<tr>
<td>4.</td>
<td>Citrus medica</td>
<td>17.01</td>
<td>2.87</td>
</tr>
<tr>
<td>5.</td>
<td>Citrus species (phouheiri)</td>
<td>5.02</td>
<td>1.53</td>
</tr>
<tr>
<td>6.</td>
<td>Docynia indica</td>
<td>19.14</td>
<td>1.90</td>
</tr>
<tr>
<td>7.</td>
<td>Elaeagnus pyriformis</td>
<td>16.10</td>
<td>3.48</td>
</tr>
<tr>
<td>8.</td>
<td>Elaeocarpus floribundus</td>
<td>10.53</td>
<td>0.95</td>
</tr>
<tr>
<td>9.</td>
<td>Hodgsonia macrocarpa</td>
<td>0.81</td>
<td>0.30</td>
</tr>
<tr>
<td>10.</td>
<td>Phyllanthus emblica</td>
<td>1.63</td>
<td>1.21</td>
</tr>
<tr>
<td>11.</td>
<td>Prunus armeniaca</td>
<td>3.53</td>
<td>1.32</td>
</tr>
<tr>
<td>12.</td>
<td>Prunus persica</td>
<td>22.33</td>
<td>3.80</td>
</tr>
<tr>
<td>13.</td>
<td>Prunus triflora var. applemix</td>
<td>16.43</td>
<td>6.85</td>
</tr>
<tr>
<td>14.</td>
<td>Prunus triflora var. kalenheikha</td>
<td>5.58</td>
<td>0.47</td>
</tr>
<tr>
<td>15.</td>
<td>Prunus triflora var. mangomix</td>
<td>4.43</td>
<td>2.66</td>
</tr>
<tr>
<td>16.</td>
<td>Prunus triflora var. maoheikha</td>
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<td>4.70</td>
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<tr>
<td>17.</td>
<td>Punica granatum</td>
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<td>2.64</td>
</tr>
<tr>
<td>18.</td>
<td>Pyrus communis</td>
<td>7.40</td>
<td>1.80</td>
</tr>
<tr>
<td>19.</td>
<td>Spondias pinnata</td>
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<td>0.94</td>
</tr>
<tr>
<td>20.</td>
<td>Zizyphus mauritiana</td>
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Table 4.9 Macroelements potassium and Magnesium content (mg/100g) in dry wt. basis of wild fruits of Manipur

<table>
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<tr>
<th>Sl. No.</th>
<th>Name of the samples</th>
<th>K (mg/100g)</th>
<th>SD</th>
<th>Mg (mg/100g)</th>
<th>SD</th>
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<tbody>
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<td>1.</td>
<td><em>Antidesma bunius</em></td>
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<td>0.04</td>
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<tr>
<td>2.</td>
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<td>34.60</td>
<td>0.74</td>
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<tr>
<td>3.</td>
<td><em>Calamus latifolius</em></td>
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<td>0.01</td>
<td>32.00</td>
<td>8.04</td>
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<td>0.01</td>
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<tr>
<td>5.</td>
<td><em>Citrus species</em> (phouheiri)</td>
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<td>0.05</td>
<td>41.00</td>
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<tr>
<td>6.</td>
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<td>0.01</td>
<td>20.60</td>
<td>0.57</td>
</tr>
<tr>
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<td>0.08</td>
<td>12.70</td>
<td>0.31</td>
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Table 4.10  Microelements Iron, Copper, Cobalt, Manganese and Zinc content (mg per 100g) in dry wt. basis. of wild fruits of Manipur

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<th>NAME OF THE SAMPLES</th>
<th>Fe (mg/100g)</th>
<th>SD</th>
<th>Cu (mg/100g)</th>
<th>SD</th>
<th>Co (mg/100g)</th>
<th>SD</th>
<th>Mn (mg/100g)</th>
<th>SD</th>
<th>Zn (mg/100g)</th>
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<td>21.8</td>
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<td>0.03</td>
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<td>0.03</td>
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<tr>
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<td>0.1</td>
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<td>1.05</td>
<td>0.29</td>
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<td>1.3</td>
<td>0.05</td>
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<td>0.1</td>
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<td>0</td>
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<tr>
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<td>1.3</td>
<td>0</td>
<td>0.05</td>
<td>0.03</td>
<td>0.9</td>
<td>0.03</td>
<td>1.8</td>
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</tr>
<tr>
<td>19.</td>
<td>Spondias pinnata</td>
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<td>1.4</td>
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<td>0.05</td>
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<td>0.06</td>
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Table 4.11 Correlation coefficient between vitamin C and IC$_{50}$ content in different fruits.

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Fig.4.1 Pairwise matrix for the result of (Anova) Significant of pH. Values with * mark are significant at p<0.05.

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Fig. 4.2 Pairwise matrix for the result of significant of moisture content. Values with * mark are significant at p<0.05.

Fig. 4.3 Pairwise matrix for the result of significant of antioxidant activity. Values with * mark are significant at p<0.05.

|    | 1   | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   | 10  | 11  | 12  | 13  | 14  | 15  | 16  | 17  | 18  | 19  | 20  |
|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 1  |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 2  | *15.39 |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 3  | *8.23  | *23.62 |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 4  | *11.67 | *3.72  | *19.89 |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 5  | *16.78 | *1.39  | *25.01 | *5.12 |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 6  | *13.26 | *2.14  | *21.45 | *1.59 | *3.53 |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 7  | *15.50 | 0.11   | *23.73 | *3.84 | *1.28 | *2.25 |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 8  | *17.10 | *5.11  | *24.38 | *4.18 | *3.72 | *2.89 | *1.60 | *2.90 | *0.65 | *4.41 | *5.11 |     |     |     |     |     |     |     |     |     |
| 9  | *10.29 | *5.11  | *24.38 | *4.18 | *3.72 | *2.89 | *1.60 | *2.90 | *0.65 | *4.41 | *5.11 |     |     |     |     |     |     |     |     |     |
| 10 | *16.16 | 0.76   | *24.38 | *4.18 | *3.72 | *2.89 | *1.60 | *2.90 | *0.65 | *4.41 | *5.11 |     |     |     |     |     |     |     |     |     |
| 11 | *14.98 | -0.41  | *24.38 | *4.18 | *3.72 | *2.89 | *1.60 | *2.90 | *0.65 | *4.41 | *5.11 |     |     |     |     |     |     |     |     |     |
| 12 | *16.27 | 0.88   | *24.38 | *4.18 | *3.72 | *2.89 | *1.60 | *2.90 | *0.65 | *4.41 | *5.11 |     |     |     |     |     |     |     |     |     |
| 13 | *17.10 | *5.11  | *24.38 | *4.18 | *3.72 | *2.89 | *1.60 | *2.90 | *0.65 | *4.41 | *5.11 |     |     |     |     |     |     |     |     |     |
| 14 | *13.63 | *2.01  | *20.61 | *1.71 | *3.40 | 0.12 | *2.13 | *1.63 | *3.09 | *4.13 | *5.01 | *6.00 | *7.00 | *8.00 | *9.00 | *10.0 | *11.0 | *12.0 | *13.0 |
| 15 | *14.47 | -0.93  | *20.61 | *1.71 | *3.40 | 0.12 | *2.13 | *1.63 | *3.09 | *4.13 | *5.01 | *6.00 | *7.00 | *8.00 | *9.00 | *10.0 | *11.0 | *12.0 | *13.0 |
| 16 | *12.85 | *5.11  | *20.61 | *1.71 | *3.40 | 0.12 | *2.13 | *1.63 | *3.09 | *4.13 | *5.01 | *6.00 | *7.00 | *8.00 | *9.00 | *10.0 | *11.0 | *12.0 | *13.0 |
| 17 | *13.37 | *2.02  | *20.61 | *1.71 | *3.40 | 0.12 | *2.13 | *1.63 | *3.09 | *4.13 | *5.01 | *6.00 | *7.00 | *8.00 | *9.00 | *10.0 | *11.0 | *12.0 | *13.0 |
| 18 | *13.63 | *1.76  | *20.61 | *1.71 | *3.40 | 0.12 | *2.13 | *1.63 | *3.09 | *4.13 | *5.01 | *6.00 | *7.00 | *8.00 | *9.00 | *10.0 | *11.0 | *12.0 | *13.0 |
| 19 | *17.28 | *1.88  | *20.61 | *1.71 | *3.40 | 0.12 | *2.13 | *1.63 | *3.09 | *4.13 | *5.01 | *6.00 | *7.00 | *8.00 | *9.00 | *10.0 | *11.0 | *12.0 | *13.0 |
| 20 | *15.14 | -0.25  | *23.67 | *3.48 | *1.64 | *3.09 | *4.13 | *5.01 | *6.00 | *7.00 | *8.00 | *9.00 | *10.0 | *11.0 | *12.0 | *13.0 | *14.0 | *15.0 | *16.0 |

Fig. 4.4 Pairwise matrix for the result of significant of soluble protein content. Value with * mark are significant at p<0.05.

|    | 1   | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   | 10  | 11  | 12  | 13  | 14  | 15  | 16  | 17  | 18  | 19  | 20  |
|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 1  |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 2  | 2.61|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 3  | *-17.14 |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 4  | *-22.45 | *-25.05 | *-5.30|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 5  | *-3.52 | *-6.13 | *13.62 | *18.92 |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 6  | *-30.27 | *-32.88 | *-13.13 | *-7.83 | *-26.75 |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 7  | *-4.39 |     |     |     |     |     | *-12.75 | *18.92 | -0.87 | *25.88 |     |     |     |     |     |     |     |     |     |     |
| 8  | *-21.66 | *-24.27 | *-4.52 | 0.79 | *18.14 | *8.61 | *17.27 |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 9  | 2.99 | 0.38 | *20.14 | *23.44 | *6.52 | *33.26 | *7.39 | *24.65 |     |     |     |     |     |     |     |     |     |     |     |
| 10 | *-15.62 | *-18.23 | 1.52 | *6.82 | *12.10 | *14.65 | *11.23 | *6.04 | *-18.62 |     |     |     |     |     |     |     |     |     |     |
| 11 | *-8.93 | *-9.54 | *10.22 | *15.52 | -3.4 | *23.35 | *2.53 | *14.73 | *-9.92 | *8.70 |     |     |     |     |     |     |     |     |     |
| 12 | *-17.58 | *-20.19 | -0.44 | *4.86 | *14.06 | *12.69 | *13.19 | *4.08 | *-20.58 | -1.96 | *10.66 |     |     |     |     |     |     |     |     |
| 14 | *-30.54 | *-33.15 | *-13.40 | *-8.09 | *27.02 | -0.27 | *26.15 | *8.88 | *-33.33 | *-14.92 | *23.61 | *-12.96 | *-21.43 |     |     |     |     |     |     |
| 16 | -3.08 | *-5.69 | *14.06 | *19.36 | 0.44 | *27.19 | 1.31 | *18.58 | *-0.68 | *12.54 | *3.84 | *14.50 | *6.03 | *27.46 | -0.8 |     |     |     |     |
| 17 | *-29.56 | *-32.17 | *-12.42 | *-7.12 | *26.04 | 0.71 | *25.17 | *-7.90 | *-32.55 | *-13.94 | *-22.63 | *-11.98 | *-20.45 | 0.98 | *-27.28 | *-26.48 |     |     |     |
| 18 | *-29.58 | *-32.19 | *-12.44 | *-7.14 | *26.06 | 0.69 | *25.19 | *-7.92 | *-32.58 | *-13.96 | *-22.66 | *-12.12 | *-20.47 | 0.96 | *-27.30 | *-26.50 | -0.02 |     |     |
| 19 | 3.13 | 0.52 | *20.28 | *23.58 | *6.66 | *33.40 | *7.53 | *24.79 | 0.14 | *18.76 | *10.06 | *20.72 | *12.23 | *33.67 | *5.42 | *6.22 | *32.69 | *32.72 |     |
| 20 | *-21.40 | *-24.01 | *-4.36 | 1.04 | *17.88 | *8.87 | *17.01 | 0.26 | *24.40 | *-5.78 | *14.48 | *-3.82 | *12.29 | *9.14 | *-19.12 | *-18.32 | *8.16 | *8.18 | *-24.54 |     |

**Fig. 4.5** Pairwise matrix for the result of significant of total soluble sugar content. Values with * mark are significant at p<0.05.

Fig. 4.6  Pairwise matrix for the result of significant of reducing sugar. Values with* mark are significant at p<0.05.

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Fig. 4.7 Pairwise matrix for the result of significant of non-reducing sugar. Values with * mark are significant at p<0.05.

|   | 1   | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   | 10  | 11  | 12  | 13  | 14  | 15  | 16  | 17  | 18  | 19  | 20  |
|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 1 | 0   |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 2 | *-.20| *-.20|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 3 | *-.20| *-.20|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 4 | *-.13| *-.13| *-.33|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 5 | -0.11| -0.11| 0.08| *.25|     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 6 | -0.01| -0.01| *.18| *.15| 0.1 |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 7 | 0.05 | 0.05| *.25| -0.08| *.16| 0.06|     |     |     |     |     |     |     |     |     |     |     |     |     |
| 8 | -0.05| -0.05| *.15| *.18| 0.06| -0.03| -0.1|     |     |     |     |     |     |     |     |     |     |     |     |
| 9 | 0.06 | 0.06| *.26| -0.07| *.17| 0.07| 0.01| 0.11|     |     |     |     |     |     |     |     |     |     |     |
| 10| -0.03| -0.03| *.16| *.17| 0.07| -0.02| -0.08| 0.01| -0.1|     |     |     |     |     |     |     |     |     |     |
| 13| -0.07| -0.07| *.12| *.21| 0.03| -0.06| *.12| -0.02| *.13| -0.03| *.17| *.37|     |     |     |     |     |     |     |
| 14| *.17| *.17| 0.02| *.31| -0.06| *.16| *.22| *.12| *.23| *.13| 0.07| *.27| -0.1|     |     |     |     |     |     |
| 15| 0.07 | 0.07| *.27| -0.06| *.18| 0.08| 0.02| *.12| 0.01| 0.11| *.32| *.52| *.15| *.25|     |     |     |     |     |
| 16| *.18| *.18| 0.01| *.32| -0.07| *.17| *.23| *.13| *.25| *.15| 0.06| *.26| -0.11| -0.01| *.26|     |     |     |     |
| 17| 0.03 | 0.03| *.23| -0.1| *.15| 0.05| -0.01| 0.08| -0.02| 0.07| *.28| *.48| 0.11| *.21| -0.03| *.22|     |     |     |
| 18| 0   | 0   | *.20| *.13| 0.11| 0.01| -0.05| 0.05| -0.06| 0.03| *.25| *.45| 0.07| *.17| -0.07| *.18| -0.03|     |
| 19| -0.07| -0.07| *.12| *.21| 0.03| -0.06| *.12| -0.02| *.13| -0.03| *.17| *.37| 0.1| *.15| 0.11| -0.11| -0.07|     |     |
| 20| -0.08| -0.08| 0.11| *.22| 0.02| -0.07| *.13| -0.03| *.15| -0.05| *.16| *.36| -0.01| 0.08| *.16| 0.1| *.12| -0.08| -0.01|

**Fig.4.8** Pairwise matrix for the result of significant of Potassium content. Values with the * mark are significant at p<0.05.

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Fig.4.9  Pairwise matrix for the result of significant of Magnesium content. Values with the * mark are significant at p<0.05.

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Fig.4.10 Pairwise matrix for the result of significant of Iron content. Values with the * mark are significant at p<0.05.

Fig. 4.11 Pairwise matrix for the result of significant of copper content. Values with * mark are significant at p<0.05

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Fig.4.12 Pairwise matrix for the result of significant of cobalt content. Here the samples does not differ significantly at p<0.05.

Fig. 4.13 Pairwise matrix for the result of significant of Mn content. Value with the * mark are significant at p<0.05.

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<td>0.13</td>
</tr>
<tr>
<td>5</td>
<td>0.31</td>
<td>-0.01</td>
<td>0.25</td>
<td>-0.08</td>
<td>*1.30</td>
<td>2.93</td>
<td>0.31</td>
<td>0.55</td>
<td>-0.31</td>
<td>-0.2</td>
<td>*20.71</td>
<td>0.35</td>
<td>0.50</td>
<td>-0.2</td>
<td>0.26</td>
<td>*0.53</td>
<td>0.13</td>
<td>*1.51</td>
<td>*3.15</td>
<td>0.53</td>
</tr>
<tr>
<td>6</td>
<td>*0.76</td>
<td>*0.43</td>
<td>*0.70</td>
<td>0.36</td>
<td>1.75</td>
<td>3.38</td>
<td>0.76</td>
<td>0.98</td>
<td>0.13</td>
<td>0.25</td>
<td>*21.16</td>
<td>*80.95</td>
<td>0.25</td>
<td>*71.01</td>
<td>*45.23</td>
<td>0.25</td>
<td>*20.73</td>
<td>0.36</td>
<td>0.51</td>
<td>*0.95</td>
</tr>
</tbody>
</table>

|   | 1   | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   | 10  | 11  | 12  | 13  | 14  | 15  | 16  | 17  | 18  | 19  | 20  |
|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 1 |     |     |     |     | 1.03|     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 2 |     |     |     | *.36| 1.4 |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 3 |     |     |     | *.36| 1.4 |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 4 |     |     |     |     | 0   |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 5 |     |     |     | 0.03|     | 0.36| 1.4 |     |     |     |     |     |     |     |     |     |     |     |     |
| 6 |     |     |     |      |     | 1.58| .55 | 1.95| 1.95| 1.55|     |     |     |     |     |     |     |     |     |
| 7 |     |     |     |      |     |     | 1.25| .15 | 1.25| 1.80|     |     |     |     |     |     |     |     |     |
| 8 |     |     |     |      |     |     |     |     |     |     | 0.83| 1.20| 1.20| 1.80| 1.75| 1.05|     |     |     |
| 9 |     |     |     |      |     |     |     |     |     |     |     | 1.25| .15 | 1.25| 1.80| 1.05|     |     |     |
| 10|     |     |     |      |     |     |     |     |     |     |     |     |     |     |     |     | 1.06| 0.01|     |     |
| 11|     |     |     |      |     |     |     |     |     |     |     |     |     |     |     |     |     |     | 1.01| 0.01|
| 12|     |     |     |      |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     | 1.03|
| 13|     |     |     |      |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     | 1.20|
| 14|     |     |     |      |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 15|     |     |     |      |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 16|     |     |     |      |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 17|     |     |     |      |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 18|     |     |     |      |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 19|     |     |     |      |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 20|     |     |     |      |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |

Fig.4.14 Pairwise matrix for the result of significant of Zn content. Values with the * mark are significant at p<0.05.

Fig. 4.15. pH of all the fruit samples.

Fig. 4.16  Showing the moisture content of all the fruit samples.

Fig. 4.17. Showing the vitamin C content of all the fruit samples.

Fig. 4.18. Showing the Antioxidant activity of all fruit samples.

Fig. 4.19. Showing the protein content of the fruit samples.

Fig. 4.20. Showing the total soluble sugar contents of all fruit samples.

Fig. 4.21. Showing the Reducing sugar content of all the fruit samples.

Fig. 4.22. Showing the Non-reducing sugar content of all fruit samples.

Fig. 4.23. Macrolelements Potassium content of all fruit samples

Fig. 4.24. Showing the Magnesium content of all the fruit samples

Fig. 4.25. Showing the Iron content of all the wild fruits

Fig. 4.26. Showing the Cu content of the twenty fruit samples.

Fig. 4.27. Showing the Co content of all the fruit samples.

Fig. 4.28. Showing the Mn content of the twenty fruit samples.

Fig. 4.29. Showing the Zn content of all the fruit samples.