Chlorinated insecticide residues in certain food samples

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To assess the magnitude of contamination in rice, jowar and wheat flour (atta) samples which form the staple food in Karnataka State, a sample survey was conducted by collecting random samples in and around Mysore. The results reveal that 20 per cent rice samples and 30 per cent of wheat flour (atta) samples contained BHC and DDT residues above the national tolerance limit. Since the level of contamination is not sufficiently high, it does not indicate direct mixing of insecticides by farmers and merchants for preservation purposes. It is noteworthy that none of the jowar samples contained pesticide residues above the safety limit. This is due to the preservation of jowar in pit storages by farmers.

The consumption of insecticide constitutes about 75 to 80 per cent of the total consumption of pesticides in the country. Among the various insecticides used, BHC and DDT together forms about 60 per cent of the total quantity (Kalra, R.L. et al, personal communication). Since the degradation and detoxification of DDT and BHC is very low in relation to other categories of insecticides, they are found in most categories of food and water. The problem of pollution with these two chlorinated insecticides is alarming in the country since unscrupulous merchants and illiterate farmers mix insecticides directly with grains for preservation as well as for seed purposes. Reports reveal excessive amount of pesticides in various commodities of food collected from Hyderabad, Punjab, Pantnagar and Delhi. Samples of wheat obtained from the Food Corporation godowns of Ludhiana and Pune showed excessive malathion residues beyond the National Safety Limit (Bindra, O.S. and Kalra, R.L., personal communication). Analysis of random samples of home meals showed that the average daily intake of DDT by an individual of 50 kg body weight is 0.358 mg as against the permissible limit of 0.25 mg per person per day.

To assess the magnitude of contamination of commonly and widely used insecticides like BHC, DDT and Endosulfan, an attempt has been made to detect and estimate the pesticide residues in rice and jowar which are the basic staple foods in south India. Data have been also collected on certain wheat flour (atta) samples.

Material & Methods

Different varieties of rice (Bangara Sanna, Gowri Sanna, Jenugudu, Hamsa, Massuri, etc.), different varieties of jowar
and wheat flour (atta) samples were collected at random from different places around Mysore and analyzed for pesticide residues. The pesticides were isolated from the sample as follows: The sample was blended with acetonitrile, filtered and extracted with hexane to remove the fat. Subsequently, the acetonitrile extract was diluted 3 times with water and extracted with hexane thrice. The combined hexane layer was subjected to column cleanup on a folorosil column eluting with mixture of petroleum ether and ethyl ether and concentrated to a 5·0 ml and injected to GLC. TLC technique was followed for qualitative identification of insecticides in the samples for parallel confirmation along with GLC. For quantification of the insecticides, GLC with electron capture detector was followed under the following conditions: Column size: 6 ft in length, 1/8" in dia; column material: 1·5 per cent SP 2250 and 1·95 per cent SP 2401 on Supelcoport 100-120 mesh; column temperature: 170°C; detector temperature: 190°C; injector temperature: 200°C; carrier gas flow rate: 55 ml/min and carrier gas: ultra pure nitrogen gas.

**Results & Discussion**

A total of 80 samples consisting of 40 samples of rice, 20 samples each of jowar and wheat flour (atta) were analyzed for organochlorine pesticide residues. The residues of pesticides were detected in almost all the 80 samples, using TLC and GLC techniques. Though all the isomers of BHC were detected by GLC, the amount of BHC residues have been expressed in terms of lindane, since the tolerance limit fixed by FAO/WHO is expressed in terms of lindane.

Out of the 40 rice samples analysed BHC was detected in all the samples, p-p<sub>1</sub> DDD and p-p<sub>1</sub> DDE in 6 samples (15%), and Endosulfan in 7 samples (17%), 20 per cent of the samples contained lindane residues in the range of 0·28 to 0·45 ppm which is above the PFA limit (0·25 ppm for grains). Totally, the residue level in rice samples was in the range of 0·01 to 0·45 ppm of lindane, 0·05-0·67 ppm of Endosulfan and 0·02-0·15 ppm of p-p<sub>1</sub> DDD and p-p<sub>1</sub> DDE (Table 1). However, the residues level of lindane was within the tolerance limit of all the samples according to FAO/WHO tolerance limit (0·5 ppm for grains).

The analysis of 20 jowar samples collected at random from different locations showed lindane residues in the range of 0·01-0·24 ppm and this range of concentration of insecticide is within the national tolerance limit (0·25 ppm for grains).

This investigation has demonstrated that farmers are not directly mixing jowar with BHC, DDT or any other insecticides, since it is being commonly stored in pits in rural areas of Karnataka.

Out of 20 wheat flour (atta) samples analyzed, 30 per cent of the samples contained lindane residues in the range of 0·42-0·85 ppm, which is above the national tolerance limit. Forty per cent of the samples showed p-p<sub>1</sub> DDD and p-p<sub>1</sub> DDE residues in the range of 0·05-0·18 ppm and 25 per cent of the samples contained lindane residues which were below the tolerance limit (Table II).

Among the three commodities of food analyzed, contamination of chlorinated insecticides is highest in wheat flour (atta) samples (6 of 20 samples, 30%)
<table>
<thead>
<tr>
<th>Variety</th>
<th>No. of samples analysed</th>
<th>BHC residues expressed in terms of individual isomers in ppm (mean ± SE)</th>
<th>p-p DDD</th>
<th>p-p DDE</th>
<th>Total DDT</th>
<th>Endosulfan</th>
<th>No. of samples exceeding tolerance limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gowrisanna</td>
<td>13</td>
<td>0·55±0·13 0·07±0·11 0·02±0·01 0·10±0·03 0·02 0·001 0·021 0·25±0·67</td>
<td>RHC</td>
<td></td>
<td>Endosulfan 2 3</td>
<td></td>
<td></td>
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<tr>
<td>Bangarasanna</td>
<td>6</td>
<td>0·95±0·14 0·11±0·01 0·02±0·02 0·04±0·02 ND ND ND ND</td>
<td></td>
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<tr>
<td>Jenugudu</td>
<td>3</td>
<td>0·25±0·14 0·05±0·03 0·0066± 0·02±0·01 ND ND ND 0·27</td>
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<td></td>
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<tr>
<td>Hamsa</td>
<td>6</td>
<td>0·61±0·31 0·13±0·06 0·05±0·02 0·06±0·03 0·08 ND ND 0·08±0·19 0·05±0·19</td>
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<tr>
<td>Massuri</td>
<td>3</td>
<td>1·84±0·94 0·27±0·07 0·08±0·03 0·06±0·03 ND 0·15 0·15 ND 0·05±0·19</td>
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<tr>
<td>Rajia boga</td>
<td>3</td>
<td>0·40±0·22 0·04±0·02 0·0033± 0·03±0·01 ND ND ND ND</td>
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<tr>
<td>Sona rice</td>
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<td>0·78±0·36 0·09±0·03 0·02±0·03 0·03±0·03 ND ND ND ND</td>
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and lowest in jowar samples. However, about 20 per cent of the rice samples analysed (8 of 40 samples) had BHC residues above the national tolerance limit, the level of residue is so low that it does not give indication of farmers directly mixing the sample with insecticides.

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References


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