Chapter 17
Functional Foods in Hypertension:
Functional Foods in Cardiovascular Diseases

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ABSTRACT
Functional foods contain bioactive compounds which are endowed with remarkable biologically significant properties. These compounds have corrective and preventive potential for diseases affecting cardiovascular system, endocrine system, nervous system, alimentary canal by virtue of their capability to influence bio-macromolecules in the cells. Clinical evidence augments the anti-oxidant, anti-atherogenic, anti-ageing, cardio-protective and immune system modulatory role of the functional foods. However, additional research is necessitated to uncover concerns regarding optimal dose, duration, pharmacotherapeutics and adverse effects of active compounds in relation to the public health.

INTRODUCTION
Hypertension is a manifestation of the chronic abnormality affecting, either, vasculature, blood flow or cardiac efficiency and characterized by consistent elevation of arterial blood pressure to 140/90mmHg or above, in the body of an adult individual, as in Table1. It is expressed in systolic blood pressure and diastolic blood pressure, where, former relates to blood pressure in arteries when left ventricle contracts, whereas, latter corresponds to the relaxed state of left ventricle before the start of next contraction (Carretero & Oparil, 2000). Normotensive individuals have systolic blood pressure in the range of 100-140mmHg and diastolic blood pressure in the range of 60-90mmHg under resting condition, whereas, hypotensive persons have systolic blood pressure below 100mmHg and a decline in diastolic blood pressure below 60mmHg.
Hypertension is classified as primary or essential hypertension and idiopathic or secondary hypertension. In primary hypertension, a well defined etiology is unknown and this class of hypertension affects around 90% of the hypertensive population, while, secondary hypertension is ascribed to a particular cause that might be chronic renal disease, chronic diabetes mellitus, dyslipidemia, coronary artery disease and/or cushing’s syndrome and further, has a marginal prevalence of around 10% out of total hypertensive patients (James et al., 2014).

In 1977, Joint National Committee (JNC-I), classified on the Detection, Evaluation, and Treatment of Hypertension, classified hypertension on the basis of diastolic blood pressure (DBP).

Later on, in 1980, (JNC-II) classified hypertension into mild (DBP 90-104 mm Hg), moderate (DBP 105-114) and severe (DBP ≥115 mm Hg). Further, in 1984, (JNC-III) report added a new term as high-normal hypertension for the patients who had DBP in the range of 85-89 mm Hg. Additionally, (JNC-III) report introduced two more terms as isolated systolic hypertension with Systolic blood pressure (SBP ≥ 160mm Hg) and borderline isolated systolic hypertension with SBP in range of (140-159mm Hg) (JNC-3, 1993).

According to the 7th report of the Joint National Committee (JNC-7) on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure, the blood pressure can be classified into four categories (see Table 1) (Chobanian et al., 2003).

**ETIOLOGY OF HYPERTENSION**

Primary hypertension is the consequence of the interaction between diverse environmental factors and genetic factors. As such, the hypertension is attributed to various predisposing factors. Advancing age affects the elasticity of blood vessels, viscosity of blood, myocardial contractility and cardiac output, hence, negatively influences arterial blood pressure. Primary hypertension has a tendency to rise with advancing age (Kosugi et al., 2009).

Life style of an individual determines primary hypertension. Sedentary routine, coupled with minimal physical activity, habit of smoking & alcohol consumption, high fat diet, uncontrolled diabetes mellitus and emotional disturbance. Generally, personality ‘Type A’ individuals, who are sensitive, ambitious, status conscious, rigid in behavior & time management, have greater susceptibility to essential hypertension.

Obesity predisposes to metabolic syndrome and hypertension. Prevalence of hypertension in obese persons is higher in comparison to the normal healthy persons (Haslam & James, 2005). Insulin resistance is the cause of hyperglycemia, dyslipidemia and obesity, additionally, prompts to essential hypertension. Insulin regulates the blood glucose level in body by peripheral utilization of glucose as well as its

Table 1. Classification of hypertension

<table>
<thead>
<tr>
<th>Category</th>
<th>Blood Pressure(mmHg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normotensive</td>
<td>SBP (90-119) &amp; (60-79)</td>
</tr>
<tr>
<td>Pre-hypertension</td>
<td>SBP (120-139) or DBP (80-89)</td>
</tr>
<tr>
<td>Stage1 Hypertension</td>
<td>SBP (140-159) or DBP (90-99)</td>
</tr>
<tr>
<td>Stage2 Hypertension</td>
<td>SBP ≥160 or DBP ≥100</td>
</tr>
</tbody>
</table>

(DBP)- diastolic blood pressure, (SBP)- systolic blood pressure

Source: Chobanian et al. (2003)

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