

## TECHNICAL NOTE

***Solanum tuberosum*- An Appealing Alternative for Solanesol**

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**ABSTRACT**

Highly purified Solanesol is well-sold raw material. It is found that highly purified Solanesol itself can be used either as a drug or intermediate. It is mainly used in synthesis of anticancer compounds, CoQ10 and vitamin K<sub>2</sub>. At present the market rate of Solanesol is around \$300 per Kg. So the promise of reduced cost and bulk production makes *S. tuberosum* an appealing alternative for extraction of Solanesol.

**Key Words:** Solanesol, *S. tuberosum*, SDB-ethylenediamine, *N. tabacum*, CoQ10.

**INTRODUCTION**

Plant cells contain various compounds than are produced by the basic metabolic processes. On the suggestion of A.Kossel <sup>[1]</sup>, these are distinguished between basic and secondary metabolites.

Secondary metabolites are the compounds which are present in fewer amounts in plant cell or less of the dry weight. The function or importance of these compounds in plant development is not always clear, although many of them are involved in defense mechanisms or act as signaling substances <sup>[2]</sup> in plants.

Plant secondary metabolites have been a fertile area of chemical investigation. In recent years there has been an upsurge related to the realization that secondary metabolites are dietary components that may have a considerable impact on human health, and to the development of gene technology that permits modulation of the contents of desirable and undesirable components.

The Yield of natural products from a chemical and biosynthetic pathway can be increased by applying genetic engineering <sup>[3]</sup> to manipulate levels of secondary metabolites of economic values. These are of very much importance biochemically, medically, as well as economically.

**SOLANESOL**

Solanesol (C<sub>45</sub>H<sub>74</sub>O, Latin: Solanocupsin) is the natural substances which widely existed in higher plant especially in tobacco leaf (0.85-3.75), potato leaf and mulberry leaf and other plants of solanaceae family like *Solatium melongena*,

*Solatium lycopersicum*, *Capsicum annum*. These contain Solanesol to an extent of 0.30 to 0.40% <sup>[4]</sup>, while *Datura stramonium*, *Solanum nigrum*, *Nicandra physaloides*, *Cestrum nocturnum* and *Solanum xanthocarpum* contain Solanesol to an extent of 0.05 to 0.25% <sup>[4]</sup>.

Solanesol, is the starting material for many high-value biochemicals, including Vitamin K analogues and co-enzyme Q10 <sup>[5]</sup> which is virtually present in every cell in the human body and is known as the "miracle nutrient" as it can be also used as anti-aging agent. Solanesol can counteract the bacteria, diminish inflammation and hemostasis. It also has strong activity of counteracting the cancer. <sup>[6]</sup>

It is found that after introducing "Solanesol" radical into the structure of some medicines, the effects are increased distinctly. The effective anti-cancer drug N-solanesyl-N, N'-bis (3, 4-dimethoxybenzyl) ethylenediamine (SDB-ethylenediamine), when use the Solanesol materials to synthesize, the effect of drug will be 5 times than before <sup>[7, 8]</sup>.

The data from media report <sup>[9]</sup> shows that the demand for highly purified Solanesol in international market has got a growth rate of up to 15% - 20% in recent years. It is thus clear that whether used for synthesizing CoQ10 or used as a drug itself, highly purified Solanesol will usher in its "Golden Period" of market profession with continuous deepening of research and practical application.

**ALTERNATIVE SOURCES OF SOLANESOL**

According to a US patent application <sup>[10]</sup> it has been found that a Solanesol is present in mulberry leaves or silkworm feces and may be recovered therefrom. However, the Solanesol present in mulberry leaves or silkworm feces is at a low content and normally is accompanied by large amount of prenyl alcohols containing 10 to 12 isoprene units. Accordingly, the recovery of Solanesol from mulberry leaves or silkworm necessitates complicated separation and purification steps.

In contrast to mulberry leaves or silkworm feces, the potato leaves have a higher content of Solanesol which accounts to 1-3% by weight on the basis of the dry weight of the potato leaves, and advantageously the potato leaves contain substantially none of the other types of isoprenyl alcohol. <sup>[10]</sup>

There is large planting area of potato in Chinese and Indian rural. The yield of potato is almost 3 million tons in Dingxi area, Gansu province <sup>[5]</sup>. However, about 550 thousands ton of potato leaves are not effectively utilized. There would be 1.375 thousands ton of Solanesol if half of the leaves were used. The economic benefit is notable.

The only commercially used source for extraction of Solanesol is Tobacco which is produced under government control hence the amount of Solanesol is less and the cost is high so it is of very much important to work on reducing its cost. We can cultivate *S. tuberosum* easily without any legal permission.

By using plant tissue culture or genetic engineering technique we may able to increase the yield of Solanesol in *Solanum tuberosum* and the producers can isolate Solanesol in bulk from *S. tuberosum* instead of *N. tabacum*. The most conventional method for the extraction of Solanesol from potato leaves is heat-reflux extraction <sup>[5]</sup> with an organic solvent in which the Solanesol is soluble. The disadvantages of the method are: time-consuming, high consumption of solvent, higher energy consumption and high cost. The % yield, labour, cost of extraction, pharmacological knowledge, and few other parameters need to be evaluated further. However the advantages those, this new alternative offer are too good to dismiss. Thus some research work must be carry out in this direction.

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