PREPARATION OF $^{35}$S-LABELED NATURAL THIOPHENE DERIVATIVES
BY BIOSYNTHESIS IN *Tagetes* sp.

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Some $^{35}$S labeled thiophene derivatives have been prepared by biosynthesis in *in vitro* cultures of *Tagetes* sp. A different sources of isotopic sulfur were tested and the best results were achieved with $^{[35S]}$ sodium sulfate. Elemental sulfur was not incorporated. Radiochemical yields were around 1%.

INTRODUCTION

Plant cells are good sources of organic compounds. The ability of plant cells to synthesize a broad spectrum of organic chemicals can be used for the simple and elegant preparation of organic compounds with complicated structure and stereochemistry. The conventional organic preparative methods often fail or they are at least extremely laborious and time-consuming.
This aim could be well attained using cell or tissue cultures of the plants. The accumulation of the secondary metabolites is often higher than in whole plants. The in vitro cultivation ensures a good stability of conditions. Variations in the cultivation conditions enable a possibility to enhance the secondary metabolite production.

Naturally occurring thiophene derivatives are a group of natural products having a wide spectrum of biocidal activity, namely they suppress nematode populations in soils and crops. This effect is supported by UV light.

The most important source of naturally occurring thiophene derivatives are plants of the species Tagetae (Asteraceae). These compounds have been further found in Dyssodia, Porophyllum, and Pectis sp. The investigated thiophene derivatives are present in all tested Tagetes sp.

The main goal of our work was to attempt the incorporation of radioactive sulfur from various sources into secondary thiophene metabolites and to prepare $^{35}$S-labeled naturally occurring thiophene derivatives by this way.

The biosynthetic pathways of sulfur incorporation into polyacetylene derivatives in Tagetes sp. plant cells are already known. On the basis of these facts it is possible to choose the optimal radioactive sulfur source for the feeding medium.

The thiophene derivatives described previously as secondary metabolites of Tagetes sp. are 5-(4-hydroxy-1-butylnyl)-2,2′-bithiophene (BBTOH), 5-(4-acetoxy-1-butylnyl)-2,2′-bithiophene (BBTOAc), 5-(but-3-en-1-ynyl)-2,2′-bithiophene (BBT), and α-terthienyl (α-T) (Fig. 1).