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ANTIOXIDANT CHARACTERIZATION OF ACETOPHENONE THIOSEMICARBAZONE

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Petroleum products are exposed to the environment, including atmospheric oxygen, numerous microorganisms, during transportation, storage and exploitation. These factors use the components of petroleum products as a reaction source and at the same time, interact with their transformation products, causing changes in their chemical composition. As a result, this reduces the operational qualities of petroleum products, making their effectiveness and long-term storage difficult. Considering the above, the antioxidant activity of (*E*,*E*)-3-(5-bromo-2-hydroxyphenyl)-1-(4-hydroxy-2 methylphenyl)prop-2-en-1-on thiosemicarbazone was determined based on the kinetic curves of cumene autoxidation. According to the obtained results, the rate coefficient (K_7) of the reaction of the studied compounds with cumyl peroxide radicals, the stoichiometric coefficient of the induction period and the absorption kinetics of oxygen were determined. As a result of determining the induction period, it was found that the studied compound has high activity against oxidation and is more effective than the widely used 2,6-di-tert-butylphenol (ionol) in the industry.

Keywords: antioxidant, thiosemicarbazone, acetophenone, ionol, cumene

INTRODUCTION

The synthesis of polyfunctional compoundss based on phenols and the study of their application areas are considered a promising direction. Phenolic compounds are of industrial importance in the preparation of stabilizers, antioxidants, additives to oils and fuels, corrosion inhibitors, etc. The large-scale production of structural polymers with high physical and mechanical properties and special application areas based on phenols containing unsaturated bonds in the side chain, as well as the use of such compounds as effective materials in electronics, is an indicator of the importance of phenolic chemistry [1-5].

One of the application areas of phenols is the production of acetophenones, which have a wide range of applications. It should be noted that the conversion products of acetophenones are one of the rapidly developing areas of organic and petrochemical synthesis. These compounds have wide application possibilities in the synthesis of pharmaceutical, medical, heterocyclic, etc. substances. Chalcones are unsaturated aromatic ketones, and numerous works on the chemistry of flavone-chromene-type derivatives based on them are found. The indicated type of compounds are widely distributed in the plant kingdom in nature, and their research in various fields began at the beginning of the last century. However, despite this, interest in the indicated field has increased further and has developed as one of the important objects of chemical synthesis. It should also be noted that

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chalcone and flavone-chromene-type compounds, in addition to antioxidant properties in the living world, also play an important role in various physiological processes [6-10].

Taking these into account, the antioxidant properties of cresol-based acetophenone thiosemicarbazone against cumene oxidation were studied.

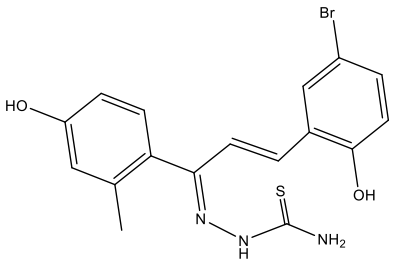
EXPERIMENTAL

Measurement. ^{1}H NMR was recorded in DMSO-d_6 using a Bruker Avance 300 NMR spectrometer (Germany, 300.13 MHz). The chemical shifts (δ) are given in ppm and referenced to residual solvent: 2.50 ppm (DMSO-d_6) for ^{1}H. Multiplicities were abbreviated as follows: s (singlet), m (multiplet).

Synthesis of (E,E)-3-(5-bromo-2-hidroksifenil)-1-(4-hidroksi-2 metilfenil)prop-2-en-1-on thiosemicarbazone.

To a flask equipped with a reflux condenser, (*E*)-3-(5-bromo-2-hydroxyphenyl)-1-(4-hydroxy-2-methylphenyl)prop-2-en-1-one (0.1 mmol), thiosemicarbazide (0.3 mmol), 0.3 ml HCl as a catalyst dissolved in 50 ml ethanol were added and stirred in a water bath for 5 hours. After the reaction was completed, the mixture was cooled and added to ice; the product was filtered and recrystallized in ethanol-water. T_{mp} = 228-230°C, yield ∼59%.

^{1}H NMR spectrum: (DMSO-d_6, δ, ppm.). 2.1 (s, 3H, CH_3), 6.7-8.4 (m, 8H, arom. and CH=CH), 8.6 (s, 1H, OH), 9.9 (s, 2H, NH_2), 10.0 (s, 1H, OH), 10.9 (s, 1H, NH).



RESULTS AND DISCUSSION

One of the important operational properties of fuels, lubricants and other petroleum products is their oxidation resistance. Since the oxidation process reduces the quality and service life of petroleum products, to prevent it and eliminate the possibility of negative consequences. Organic compounds containing nitrogen-, oxygen- and sulfur atoms as antioxidants are added to the petroleum products. Considering above, the antioxidant properties of (*E*,*E*)-3-(5-bromo-2-hydroxyphenyl)-1-(4-hydroxy-2 methylphenyl)prop-2-en-1-on thiosemicarbazone were studied.

The antioxidant activity of the investigated compound was determined based on the kinetic curves of cumene autoxidation. As a result of determining the induction periods, it was found that the studied compound has high activity against oxidation, and it is more effective than 2,6-di-tert-butylphenol (ionol), which is widely used in industry.

An interesting fact is that investigated compound showed the highest results as the best inhibitor against *AChE* and *BchE* and antibacterial activity against *E.coli*, *K. pneumoniae* [11].

The strong inhibitor and antioxidant properties of the studied compound can be explained by the simultaneous presence of aromatic ring, unsaturated bond, S-, Br atoms, NH and phenol OH groups in the molecule.

CONCLUSIONS

The antioxidant properties of (*E*,*E*)-3-(5-bromo-2-hydroxyphenyl)-1-(4-hydroxy-2 methylphenyl)prop-2-en-1-on thiosemicarbazone were studied. Obtained results have shown that this compound is 2.7 times more effective against cumene oxidation than industry ionol.

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