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# The impact factor of the thiirane group in organic compounds on their predicted pharmacological activities: A brief review

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**Abstract**
The present review describes the biological activities of organic compounds containing the thiirane group. We looked at how the thiirane group can influence the biological activity of aliphatic, cyclic and aromatic hydrocarbons, as well as the organometaloid compounds containing thiirane group. The structures and predicted activities of these compounds are available. With the computer programme PASS and based on structure–activity relationships (SAR), some additional activities are also predicted, which point towards new possible applications of these lipids. This review emphasizes the role of thiirane containing compounds as an important source and potential leads for drug discovery and they are of great interest to chemists, physicians, biologists, pharmacologists and the pharmaceutical industry.

**Keywords:** Thiirane group, aliphatic, cyclic, aromatic, hydrocarbons activities, SAR, PASS

## Introduction
The chemistry of thiirane-containing compounds has played a considerable role in the development of modern organic, bioorganic and medicinal chemistry (Livingstone, 1964; Sander, 1966; Chew and Harpp 1993; Setzer, 2009; Voss *et al*., 2009; Vizer *et al*., 2015) [23, 26, 3, 27, 32, 31]. Foremost among these reactive molecules are the small ring sulphur containing heterocycles (Searles *et al*., 1973; Block 2013; Warkentin and Plażuk 2008; Adam and Bargon 2004) [28, 2, 33, 1].

Thiirane derivatives have been reported to possess variety of cytotoxic activities, and showed other anticipated biological activities (Dembitsky *et al*., 2017; Kuklev *et al*., 2017; Poroikov *et al*., 2017) [8, 16, 25]. Thiirane-containing compounds are widely used as anticancer agents. Also, thiiranes which demonstrated confirmed activity as inhibitors of the peptidase, carboxypeptidase A, gelatinase, aromatase and metalloproteinases. The thiirane moiety is an important substance and shows some important biological activities (Fernández *et al*., 2010; Lee *et al*., 2008; Testero *et al*., 2011a,b; Gooyit *et al*., 2011a,b; Overall and Kleifeld, 2006) [9, 18, 29, 30, 13, 14, 24].

As already proved by numerous works, there is a relationship between structure and activity, and this principle is called SAR (Structure-Activity-Relationship). We used the computer program PASS, containing about one million chemical compounds and more than 8,000 biological activities, and calculated the biological activity of different natural and/or synthetic compounds (Dembitsky *et al*., 2005, 2007, 2017; Kilimnik *et al*., 2017; Levitsky *et al*., 2016, 2017) [4, 5, 6, 15, 20, 21]. PASS predictions are based on SAR analysis of the training set consisting of more than one million drugs, drug candidates and lead compounds. The algorithm of PASS practical utilization is described in detail in several publications (Filz and Poroikov, 2012; Filimonov *et al*., 2011; Gloriozova *et al*., 2017) [11, 10, 12].

This review is devoted to synthetic aliphatic, cyclic and aromatic hydrocarbons, as well as the organometaloid compounds containing thiirane group and the biological activity of these compounds.

## Thiirane containing aliphatic and cyclic hydrocarbons and derivatives
Recently, we have described the biological activities of the synthetic thiirane-containing fatty (carboxylic) acids, and have shown that these compounds exhibit the following biological activities as a lipid metabolism regulator, a radioprotector, or a hypolipidemic agent and they also show other pharmacological activities (Kuklev *et al*., 2017) [16].

In addition, about 40 natural thiirane-containing metabolites show confirmed pharmacological activity, including antitumor, antimicrobial, and antibacterial effects (Poroikov *et al*., 2017) [25], and 50 thiirane containing steroids have shown confirmed antitumor, immunosuppressant, or aromatase inhibitor, and other activities (Dembitsky *et al*., 2017) [8].

The structures of thiirane containing aliphatic and cyclic hydrocarbons shown in Figure 1 were not previously studied for their biological activity or pharmacological properties were not described. Table 1 shows predicted pharmacological activities for compounds (1-26). According to the data given in Table 1, more than 30 different activities are described for this class of compounds, although antiviral, antidiabetic, or antineoplastic activities may be characteristic.

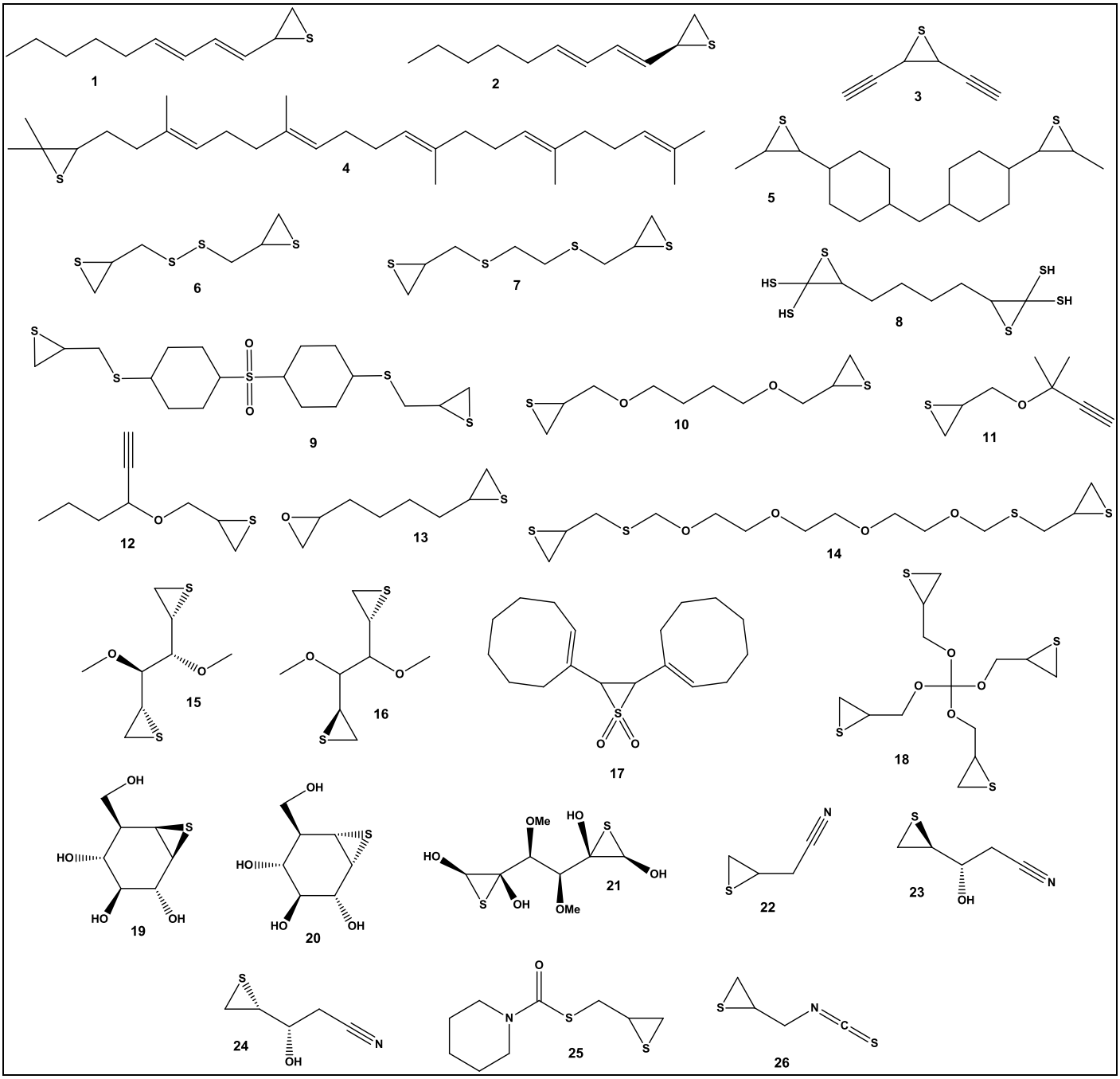


**Fig 1:** Biological active thiirane containing aliphatic and cyclic hydrocarbons and their derivatives

**Table 1:** Predicted pharmacological activities of aliphatic and cyclic hydrocarbons and their derivatives (1-26)

| No. | Predicted pharmacological activities of aliphatic and cyclic hydrocarbons (Pa)* |
|---|---|
| 1 | Antiviral (Arbovirus) (0,775); Antiulcerative (0,670); Angiogenesis stimulant (0,663); Cytoprotectant (0,641); Acute neurologic disorders treatment (0,650); Apoptosis agonist (0,615); Antineoplastic (0,636); Radioprotector (0,585); Lipid metabolism regulator (0,582) Antiinflammatory (0,593); Leukopoiesis stimulant (0,567); Dermatologic (0,558) Chemoprotective (0,542); Antifungal (0,530); Mucositis treatment (0,540) |
| 2 | Antiviral (Arbovirus) (0,775); Antiulcerative (0,670); Angiogenesis stimulant (0,663); Cytoprotectant (0,641); Acute neurologic disorders treatment (0,650); Apoptosis agonist (0,615); Antineoplastic (0,636); Radioprotector (0,585); Lipid metabolism regulator (0,582); Antiinflammatory (0,593); Leukopoiesis stimulant (0,567); Dermatologic (0,558) Chemoprotective (0,542); Antifungal (0,530); Mucositis treatment (0,540) |
| 3 | Bone diseases treatment (0,794); Phobic disorders treatment (0,809); Hypolipemic (0,709); Ovulation inhibitor (0,662); Dermatologic (0,627); Kidney function stimulant (0,635); Leukopoiesis stimulant (0,568); Muscular dystrophy treatment (0,545); Antiviral (Arbovirus) (0,585); Alopecia treatment (0,544) |
| 4 | Hypolipemic (0,874); Antineoplastic (0,789); Apoptosis agonist (0,729); Antiinflammatory (0,685); Muscular dystrophy treatment (0,615); Antiulcerative (0,620); Antiviral (Arbovirus) (0,633); Antifungal (0,605); Radioprotector (0,585) Chemoprotective (0,573); Antioxidant (0,570); Dermatologic (0,567); Hepatic disorders treatment (0,557); Antimitotic (0,553); Lipid metabolism regulator (0,562); Acute neurologic disorders treatment (0,559); Antibacterial (0,520) |
| 5 | Antidiabetic (0,778); Cardiotonic (0,734); Atherosclerosis treatment (0,714) Phobic disorders treatment (0,724) Myasthenia Gravis treatment (0,677); Kidney function stimulant (0,610); Erythropoiesis stimulan (0,567) Antinephrotoxic (0,552); Antiischemic, cerebral (0,548) |
| 6 | Antiseborrheic (0,775); Phobic disorders treatment (0,721); Leukopoiesis stimulant (0,641); Acute neurologic disorders treatment (0,624); Stroke treatment (0,594); Kidney function stimulant (0,600); Antiviral (Picornavirus) (0,594) Growth stimulant (0,568); Lipotropic (0,558); Alopecia treatment (0,562); Chemoprotective (0,521) |
| 7 | Antiallergic (0,796); Antiseborrheic (0,768); Antiasthmatic (0,723); Kidney function stimulant (0,594); Phobic disorders treatment (0,640); Leukopoiesis stimulant (0,562); Stroke treatment (0,531) |
| 8 | Phobic disorders treatment (0,805); Kidney function stimulant (0,756); Hepatic disorders treatment (0,706); Growth stimulant (0,700); Mucositis treatment (0,684); Radioprotector (0,667); Antiviral (Picornavirus) (0,654); Chemoprotective (0,649) Antitoxic (0,650); Leukopoiesis inhibitor (0,623); Antianginal (0,593); Neuroprotector (0,570) |
| 9 | Inflammatory Bowel disease treatment (0,972); Autoimmune disorders treatment (0,959); Antiarthritic (0,957) Antiasthmatic (0,936); Antiischemic, cerebral (0,780); Stroke treatment (0,560) |
| 10 | Phobic disorders treatment (0,821); Leukopoiesis stimulant (0,713); Sclerosant (0,563); Fibrinolytic (0,559) Antineoplastic (sarcoma) (0,537); Lipotropic (0,511) |
| 11 | Antineoplastic (sarcoma) (0,549); Genital warts treatment (0,552) |
| 12 | Antineoplastic (sarcoma) (0,595); Leukopoiesis stimulant (0,517) |
| 13 | Antiischemic, cerebral (0,676); Antineoplastic (sarcoma) (0,622); Lipotropic (0,573); Growth stimulant (0,520) |
| 14 | Myocardial ischemia treatment (0,951); Antihypertensive (0,886); Antianginal (0,848); Chemoprotective (0,825) Ophthalmic drug (0,794); Antiallergic (0,746); Radioprotector (0,727); Antiasthmatic (0,677); Neurodegenerative diseases treatment (0,649); Antineoplastic (0,597); Antioxidant (0,526) |
| 15 | Phobic disorders treatment (0,791); Acute neurologic disorders treatment (0,635); Leukopoiesis stimulant (0,606) Antiischemic, cerebral (0,613); Antiviral (Arbovirus) (0,610); Antineoplastic (sarcoma) (0,588); Stroke treatment (0,556) Antineurotic (0,591); Pediculicide (0,538); Antidiabetic (0,551); Lipotropic (0,530); Kidney function stimulant (0,563) |
| 16 | Phobic disorders treatment (0,791); Acute neurologic disorders treatment (0,635); Antiischemic, cerebral (0,613) Leukopoiesis stimulant (0,606); Antiviral (Arbovirus) (0,610); Antineoplastic (sarcoma) (0,588); Stroke treatment (0,556) Antineurotic (0,591); Antidiabetic (0,551); Antiviral (Picornavirus) (0,549); Kidney function stimulant (0,563); Lipotropic (0,530) |
| 17 | Phobic disorders treatment (0,731); Alopecia treatment (0,611); Ovulation inhibitor (0,602); Kidney function stimulant (0,555) |
| 18 | Phobic disorders treatment (0,739); Leukopoiesis stimulant (0,636); Antineoplastic (sarcoma) (0,565) Kidney function stimulant (0,561); Lipotropic (0,550) |
| 19 | Platelet aggregation inhibitor (0,900); Antidiabetic (0,860); Genital warts treatment (0,859); Antineoplastic (0,775) Cardiotonic (0,625); Lipotropic (0,605); Kidney function stimulant (0,615); Vasoprotector (0,588); Antithrombotic (0,577) Immunosuppressant (0,584); Atherosclerosis treatment (0,563); Leukopoiesis stimulant (0,564); Antiinflammatory (0,565) |
| 20 | Platelet aggregation inhibitor (0,900); Antidiabetic (0,860); Genital warts treatment (0,859); Antineoplastic (0,775) Cardiotonic (0,625); Lipotropic (0,605); Kidney function stimulant (0,615); Vasoprotector (0,588); Antithrombotic (0,577) Immunosuppressant (0,584); Atherosclerosis treatment (0,563); Leukopoiesis stimulant (0,564); Antiinflammatory (0,565) |
| 21 | Antidiabetic (0,820); Phobic disorders treatment (0,801); Antiischemic, cerebral (0,672); Carminative (0,629) Leukopoiesis stimulant (0,574); Antiviral (Arbovirus) (0,604); Genital warts treatment (0,621); Kidney function stimulant (0,583) Fibrinolytic (0,584); Preneoplastic conditions treatment (0,538); Antineurotic (0,566) |
| 22 | Inflammatory Bowel disease treatment (0,606); Phobic disorders treatment (0,663); Pediculicide (0,554); Carminative (0,544); Alopecia treatment (0,530); Kidney function stimulant (0,549); Leukopoiesis stimulant (0,520); Cytoprotectant (0,523) |
| 23 | Antiischemic, cerebral (0,617); Antiviral (Picornavirus) (0,594); Phobic disorders treatment (0,574); Growth stimulant (0,570) Radioprotector (0,552); Leukopoiesis stimulant (0,530); Antiviral (Arbovirus) (0,564) |
| 24 | Antiischemic, cerebral (0,617); Antiviral (Picornavirus) (0,594); Phobic disorders treatment (0,574); Growth stimulant (0,570) Radioprotector (0,552); Leukopoiesis stimulant (0,530); Antiviral (Arbovirus) (0,564) |
| 25 | Antiischemic, cerebral (0,633); Antineoplastic (sarcoma) (0,576); Kidney function stimulant (0,504) |
| 26 | Apoptosis agonist (0,951); Chemoprotective (0,782); Antineoplastic (0,775); Chemosensitizer (0,614) Antischistosomal (0,593); Kidney function stimulant (0,521); Phobic disorders treatment (0,553) |

* Only activities with Pa > 0.5 are shown

**Thiirane containing aromatic compounds and derivatives**

The most known among the aromatic compounds containing the thiirane group is compound, 2-(4-phenoxyphenylsulfonylmethyl) thiirane (31), which was synthesized in 2004 (Lim *et al*., 2004) [22]. A study of the biological activity of this compound showed that it is a selective inhibitor of gelatinases. Later, the (*R*)-1 and (*S*)-1 enantiomers were synthesized and both showed to be equally active in inhibition of gelatinases (Lee *et al*., 2005) [17]. More recently, more than 70 different derivatives have been synthesized, including sulfone surrogates, such as sulfonamide, aminosulfone, and methylsulfone, including (35, 36, 37, 40, 42, 43, 45, 46 and 47). These compounds showed varying degrees of inhibition and some of them are a potent and highly selective inhibitor of human gelatinases and a prototype for the thiirane class of matrix metalloproteinase inhibitors (Lee *et al*., 2012; Gooyit *et al*., 2009) [19, 14].

The pharmacological activity of aromatic compounds and their derivatives (27-47) is shown in Table 2, and the structures of these compounds are shown in Figure 2.

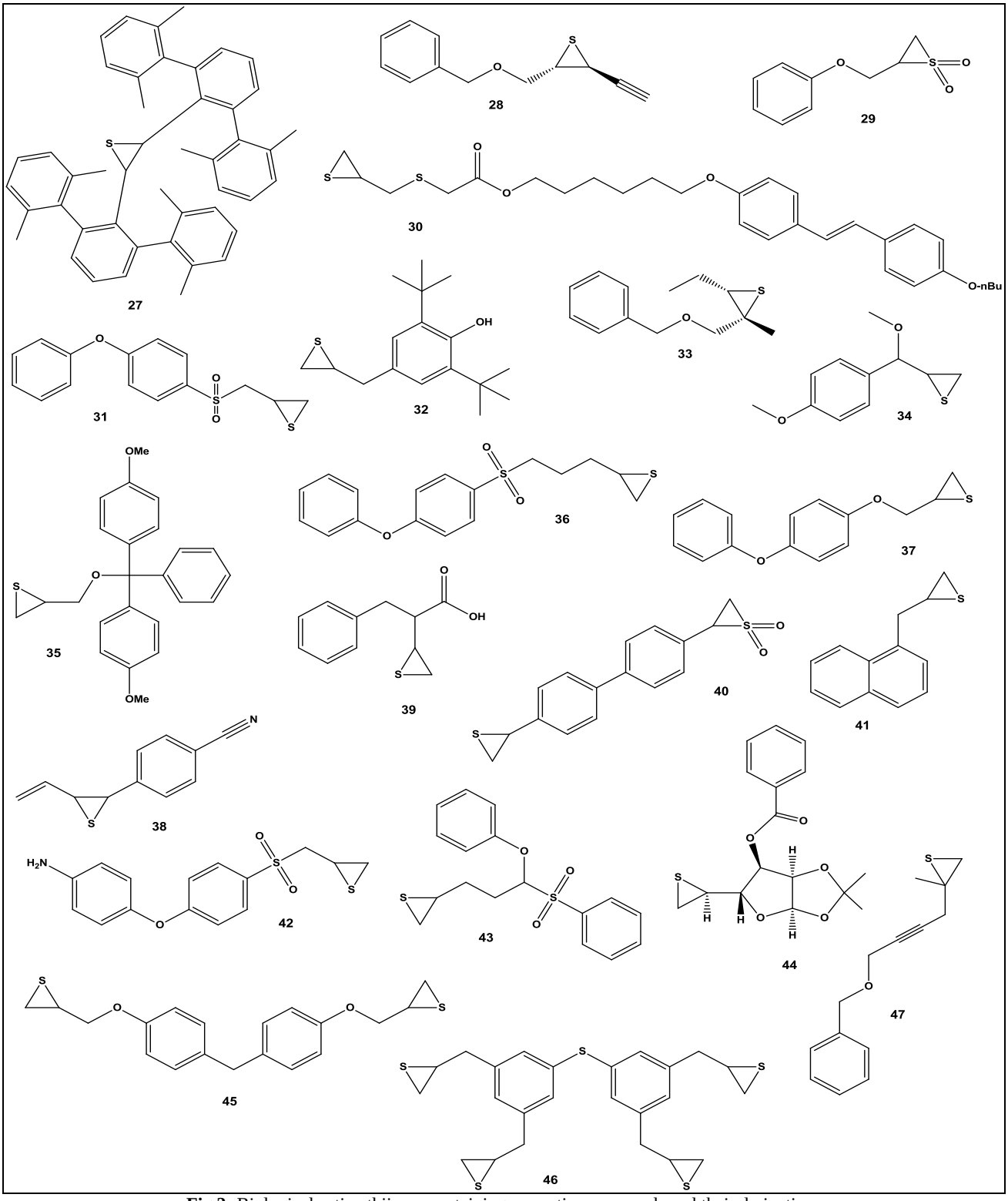


**Fig 2:** Biological active thiirane containing aromatic compounds and their derivatives

**Table 2:** Predicted pharmacological activities of aromatic compounds and their derivatives (27-47)

| No. | Predicted pharmacological activities of aromatic compounds (Pa)* |
|---|---|
| 27 | Antiinflammatory (0,901); Postmenopausal disorders treatment (0,745); Antiprotozoal (0,663); Phobic disorders treatment (0,710) Atherosclerosis treatment (0,628); Kidney function stimulant (0,609); Cardiotonic (0,577); Antiviral (Arbovirus) (0,549) |
| 28 | Phobic disorders treatment (0,659); Antineoplastic (liver cancer) (0,594); Pediculicide (0,535); Antipsoriatic (0,543) Bone diseases treatment (0,520) |
| 29 | Acute neurologic disorders treatment (0,600); Phobic disorders treatment (0,605); Leukopoiesis stimulant (0,519) |
| 30 | Antiulcerative (0,641); Antiallergic (0,638); Acute neurologic disorders treatment (0,600); Antiasthmatic (0,565) Radioprotector (0,557); Antieczematic (0,578); Lipid metabolism regulator (0,529); Antiseborrheic (0,519) |
| 31 | Antineoplastic (0,734); Acute neurologic disorders treatment (0,593); Angiogenesis inhibitor (0,554); Stroke treatment (0,537) |
| 32 | Acute neurologic disorders treatment (0,789); Antidiabetic (0,705); Hypolipemic (0,675); Lipid metabolism regulator (0,594) Antiinflammatory (0,580); Antianginal (0,562); Antimyopathies (0,540); Inflammatory Bowel disease treatment (0,541) |
| 33 | Fibrinolytic (0,619); Pediculicide (0,571); Inflammatory Bowel disease treatment (0,528); Phobic disorders treatment (0,574) |
| 34 | Carminative (0,650); Phobic disorders treatment (0,561) |
| 35 | Antiprotozoal (0,624) |
| 36 | Antiischemic, cerebral (0,754); Antineoplastic (sarcoma) (0,542) |
| 37 | Antidiabetic (0,525); Pediculicide (0,522); Antiischemic, cerebral (0,534); Antineoplastic (sarcoma) (0,509) Antiviral (Picornavirus) (0,507) |
| 38 | Antidiabetic (0,648); Alopecia treatment (0,572); Cytoprotectant (0,555); Antianginal (0,554); Antihypertensive (0,517) |
| 39 | Phobic disorders treatment (0,794); Acute neurologic disorders treatment (0,687); Kidney function stimulant (0,629) Mucositis treatment (0,609); Lipid metabolism regulator (0,589); Leukopoiesis stimulant (0,579) Antiviral (Arbovirus) (0,607); Antiviral (Picornavirus) (0,575); Antiinflammatory (0,588); Alopecia treatment (0,566); Inflammatory Bowel disease treatment (0,554) Antidiabetic (0,548); Antineoplastic (sarcoma) (0,563); Antiarthritic (0,536); Radioprotector (0,529) |
| 40 | Stroke treatment (0,631); Antiallergic (0,608); Antianginal (0,597); Antiasthmatic (0,563); Dermatologic (0,551) Antidepressant (0,519) |
| 41 | Antidiabetic (0,692); Phobic disorders treatment (0,644); Acute neurologic disorders treatment (0,585), Antiischemic, cerebral (0,525); Alopecia treatment (0,511) |
| 42 | Acute neurologic disorders treatment (0,683); Stroke treatment (0,550); Angiogenesis inhibitor (0,551) |
| 43 | Antineoplastic (sarcoma) (0,582) |
| 44 | Antidiabetic (0,620); Antiischemic, cerebral (0,613); Fibrinolytic (0,575) |
| 45 | Antineoplastic (0,856); Antiinflammatory (0,817); Autoimmune disorders treatment (0,766); Immunosuppressant (0,641) Antifungal (0,601); Dermatologic (0,564); Antiallergic (0,542); Antibacterial (0,536) |
| 46 | Antidiabetic (0,733); Acute neurologic disorders treatment (0,603) |
| 47 | Antieczematic (0,835); Antiischemic, cerebral (0,613 |

* Only activities with Pa > 0.5 are shown

**Thiirane containing adamantine and derivatives and their predicted pharmacological activities**

Previously, we have already examined adamantine fatty acids and have shown that they are interesting compounds, and have predominantly antiviral, kidney function stimulant, and phobic treatment activities (Kuklev *et al*., 2017) [16]. Figure 3 shows the structures of thiirane containing adamantine compounds (48-59), and their biological activity is presented in Table 3.

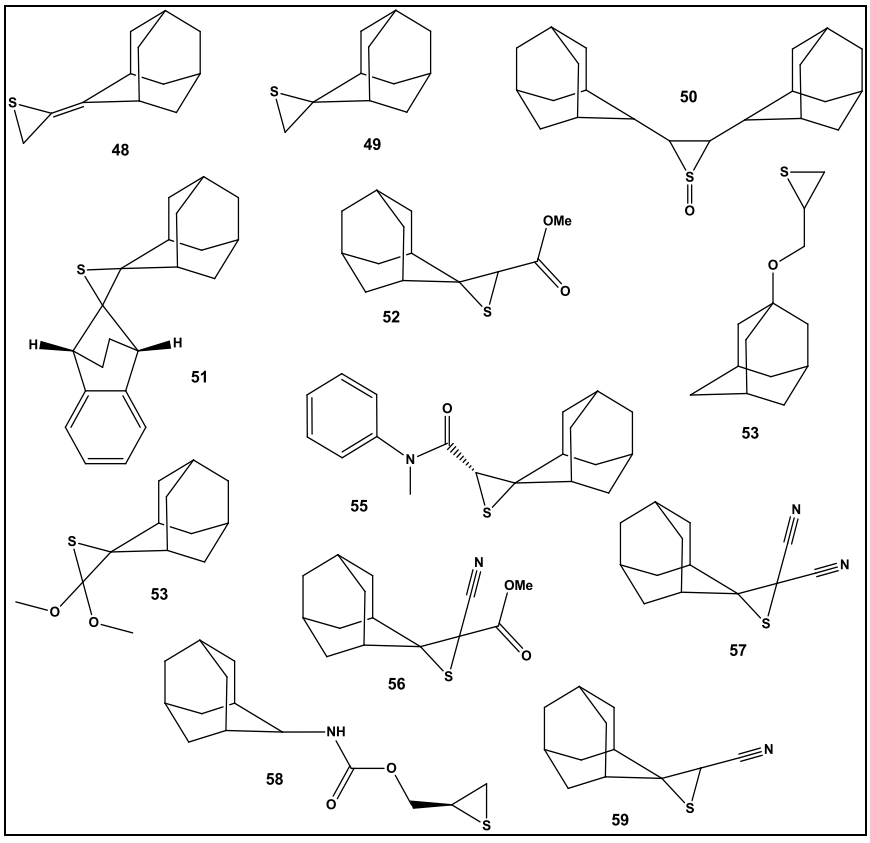


**Fig 3:** Biological active thiirane containing adamantine and their derivatives

**Table 3:** Predicted pharmacological activities of adamantane and derivatives (48-59)

| No. | Predicted pharmacological activities of adamantane and derivatives (Pa)* |
|---|---|
| 48 | Phobic disorders treatment (0,795); Kidney function stimulant (0,721); Antiviral (Arbovirus) (0,717) Antiseborrheic (0,699); Alopecia treatment (0,556); Stroke treatment (0,541); Antiviral (Picornavirus) (0,549) Leukopoiesis stimulant (0,544); Anticonvulsant (0,542) |
| 49 | Phobic disorders treatment (0,818); Kidney function stimulant (0,775); Cognition disorders treatment (0,715) Antiviral (Arbovirus) (0,716); Antiseborrheic (0,704); Antiviral (Picornavirus) (0,647); Antinephrotoxic (0,622) Leukopoiesis stimulant (0,584); Alopecia treatment (0,583); Antieczematic (0,558) |
| 50 | Phobic disorders treatment (0,818); Antiischemic, cerebral (0,756); Kidney function stimulant (0,696); Antiviral (Arbovirus) (0,654); Antinephrotoxic (0,608); Antiviral (Picornavirus) (0,575); Alopecia treatment (0,569); Cytoprotectant (0,578); Acute neurologic disorders treatment (0,583); Cardiovascular analeptic (0,555); Cognition disorders treatment (0,520) |
| 51 | Phobic disorders treatment (0,908); Cognition disorders treatment (0,763); Kidney function stimulant (0,747) Genital warts treatment (0,765); Antiviral (Arbovirus) (0,734); Antineurotic (0,743); Alopecia treatment (0,718) Antiviral (Picornavirus) (0,666); Cardiovascular analeptic (0,647); Ovulation inhibitor (0,620); Antiparkinsonian, rigidity relieving (0,612); Spasmolytic, urinary (0,612); Antisecretoric (0,589); Antidyskinetic (0,592); Erythropoiesis stimulant (0,542) Vasoprotector (0,526); Antiobesity (0,521) |
| 52 | Phobic disorders treatment (0,810); Cognition disorders treatment (0,783); Kidney function stimulant (0,684) Antiviral (Picornavirus) (0,621); Antiviral (Arbovirus) (0,624); Antinephrotoxic (0,573); Fibrinolytic (0,597) |
| 53 | Antidiabetic (0,681); Antinephrotoxic (0,543); Antiviral (Arbovirus) (0,579); Antiviral (Picornavirus) (0,535) Kidney function stimulant (0,555); Phobic disorders treatment (0,585) |
| 54 | Phobic disorders treatment (0,867); Antiviral (Arbovirus) (0,748); Kidney function stimulant (0,742) Cognition disorders treatment (0,734); Carminative (0,729); Antiviral (Picornavirus) (0,663); Cardiovascular analeptic (0,649) Antinephrotoxic (0,643); Antineurotic (0,658); Antidyskinetic (0,592); Leukopoiesis stimulant (0,546) Antidiabetic (0,545); Dementia treatment (0,530) |
| 55 | Cognition disorders treatment (0,728); Antiviral (Arbovirus) (0,690); Kidney function stimulant (0,663); Phobic disorders treatment (0,708); Antiviral (Picornavirus) (0,629) |
| 56 | Antihypertensive (0,827); Phobic disorders treatment (0,785); Kidney function stimulant (0,663) Antinephrotoxic (0,549); Antieczematic (0,575); Antiviral (0,505) |
| 57 | Antiviral (0,807); Phobic disorders treatment (0,818); Cognition disorders treatment (0,759); Kidney function stimulant (0,749) Alopecia treatment (0,675); Antinephrotoxic (0,622); Antiseborrheic (0,590); Dementia treatment (0,547) Cytoprotectant (0,569); Ovulation inhibitor (0,536); Antineurotic (0,557); Antieczematic (0,558) |
| 58 | Antidiabetic (0,536); Phobic disorders treatment (0,501) |
| 59 | Cognition disorders treatment (0,858); Antiviral (Picornavirus) (0,708); Phobic disorders treatment (0,734) Kidney function stimulant (0,694); Alopecia treatment (0,591); Antiviral (Arbovirus) (0,603); Antinephrotoxic (0,555) |

* Only activities with Pa > 0.5 are shown

**Thiirane containing Se and Te compounds and derivatives**

Synthetic Se and Te compounds were tested for their biological activity, and the results showed interesting properties of these compounds. So steroids containing Se and Te are very interesting and useful compounds for pharmacology. For the selena steroids the main characteristics are antineoplastic and anti-seborrheic activities. Additionally, these Selena steroids of this group can be used to treat Alzheimer's disease. The second group includes steroids where selenium is in the second and third positions of the steroid. For selena steroids of the second group, the main activities are antineoplastic, anti-hypercholesterolemia and anti-inflammatory. The third group includes steroids in which the selenium atom is in position six of the core molecules. For tellura steroids, whose tellurium is incorporated into the steroid skeleton, the following basic properties are characteristics: antioxidant, anti-inflammatory, antineoplastic, antiseborrheic, and antiprotozoal activities, and they can be used as anti-parkinsonian, anti-Alzheimer's disease and anti-neurodegenerative agents (Dembitsky *et al*., 2017) [7].

The structures of thiirane containing Se and Te compounds and derivatives (60-69) are shown in Figure 4, and their predicted pharmacological activities are presented in Table 4.

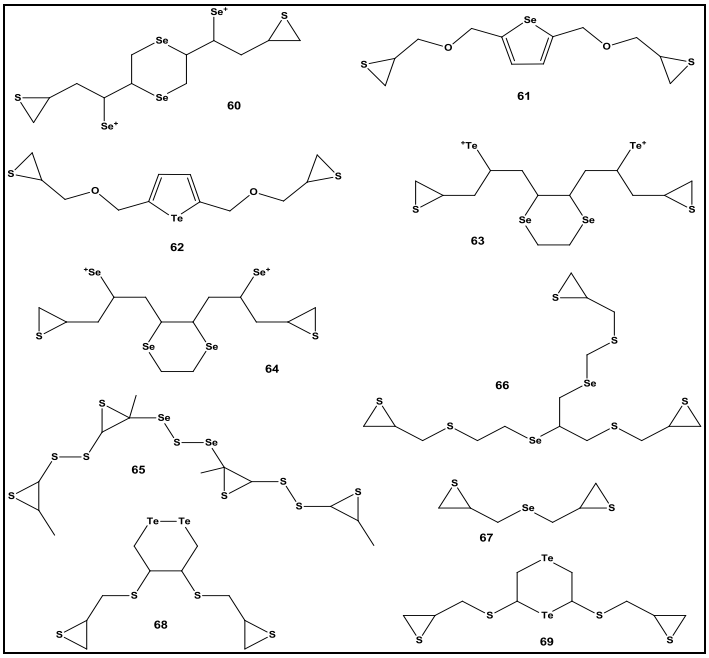


**Fig 4:** Biological active thiirane containing Se and Te compounds and their derivatives

**Table 4:** Predicted pharmacological activities of Se and Te compounds and derivatives (60-69)

| No. | Predicted pharmacological activities of Se and Te compounds (Pa)* |
|---|---|
| 60 | Antineoplastic (0,890); Antimitotic (0,767); Chemoprotective (0,634) |
| 61 | Antineoplastic (0,737); Antimitotic (0,704); Chemoprotective (0,606) |
| 62 | Antioxidant (0,924); Antiarthritic (0,703); Phobic disorders treatment (0,663); Leukopoiesis stimulant (0,568) |
| 63 | Antioxidant (0,621); Antiarthritic (0,603); Phobic disorders treatment (0,552); Leukopoiesis stimulant (0,504) |
| 64 | Antioxidant (0,767); Antiarthritic (0,733); Phobic disorders treatment (0,658); Leukopoiesis stimulant (0,534) |
| 65 | Antioxidant (0,855); Neurodegenerative diseases treatment (0,834); Phobic disorders treatment (0,750); Antineoplastic (0,723) Stroke treatment (0,695); Anticoagulant (0,631); Leukopoiesis stimulant (0,625); Ophthalmic drug (0,604) Kidney function stimulant (0,616); Alopecia treatment (0,565) |
| 66 | Antineoplastic (0,958); Chemoprotective (0,846); Stroke treatment (0,764); Alzheimer's disease treatment (0,587) Acute neurologic disorders treatment (0,568); Antiseborrheic (0,521) |
| 67 | Chemoprotective (0,905); Antiprotozoal (0,862); Antineoplastic (0,854); Phobic disorders treatment (0,721) Cognition disorders treatment (0,645); Psychosexual dysfunction treatment (0,593); Stroke treatment (0,580) Kidney function stimulant (0,600); Leukopoiesis stimulant (0,579); Acute neurologic disorders treatment (0,577) Antiseborrheic (0,554) |
| 68 | Antiischemic, cerebral (0,762); Stroke treatment (0,632); Antioxidant (0,551); Phobic disorders treatment (0,591) |
| 69 | Antioxidant (0,977); Neurodegenerative diseases treatment (0,931); Atherosclerosis treatment (0,912) Antiinflammatory (0,881); Antineoplastic (0,759); Phobic disorders treatment (0,683); Antiseborrheic (0,624) Kidney function stimulant (0,573); Leukopoiesis stimulant (0,546) |

* Only activities with Pa > 0.5 are shown

## Conclusions

Interesting data on the pharmacological activity of synthetic thiirane containing compounds belonging to different groups of organic compounds are presented. It has been shown that all compounds containing thiirane group show significant activity in various fields of pharmacological action on various diseases, and for each group of compounds, certain selective activity is characteristic. The results described in this article may be of interest for both academic science and the pharmacological industry.

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## A competing interest

Authors have declared that no competing interests exist.

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