Anthracene derivatives Hypericum perforatum

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Anthracenderivatives of Hypericum perforatum L. (review)

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RESUME

In the present review the aspects of chemical structures, analysis and pharmacotherapeutical effects anthracenderivatives of the St.-John's wort (Hypericum perforatum L.) herbs - hypericin and pseudohypericin are discussed.

Keywords: the St. John's wort, Hypericum perforatum L., anthracenderivatives, hypericin, pseudohypericin.

SUMMARY

The presented review reflects the questions of the chemical structure, analysis and pharmacotherapeutic effects of anthracene derivatives of the herb Hypericum perforatum - hypericin and pseudohypericin.

Key words: anthracene derivatives, hypericin, pseudohypericin,St. John's wort, Hypericum perforatum L.

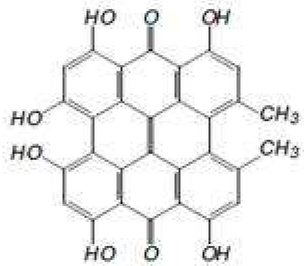
St. John's wort herb is used in medical practice to obtain antimicrobial, anti-inflammatory and antidepressant drugs [1, 2, 3]. Raw materials are obtained from two types of medicinal plants: St. John's wort (Hypericum per-foratum L.) and St. John's wort (Hypericum maculatum Crantz; synonym Hypericum quad-rangulum L.) [1]. The chemical composition of St. John's wort is represented primarily by flavonoids (rutin, hyperoside. Bisapigenin) [2, 3, 4, 5]. In addition, the content of phloroglucins (hyperforin), essential oil, tannins and sterols is noted [2, 3, 4]. However, the most characteristic and unique components of St. John's wort are anthracene derivatives [2, 3, 4, 5]. At the same time, it is this group of substances that, in our opinion, is an insufficiently studied group of biologically active substances of St. John's wort. Literary sources indicate that the main anthracene derivatives of St. John's wort are hypericin, pseudohypericin [3, 4, 5]. The presence of minor amounts of other substances of this class is also noted [4, 5]. At the same time, all authors note that the content of hypericin and pseudohypericin in the raw material is small and inferior in content to the leading group - flavonoids [3, 4, 6, 7, 8].

It should be noted that there is still no consensus on the chemical structure of pseudohypericin. In the literature, there are at least three versions of the image of the pseudohypericin formula [2, 4, 5, 9]. This fact can be explained by the fact that in the Russian Federation there was no research on purposeful

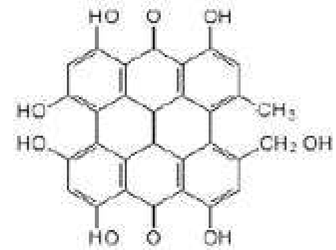
isolation of this unique group of biologically active substances from the herb St. John's wort. Perhaps this is due to the fact that the process of separating anthracene derivatives from raw materials is rather laborious.

In our opinion, the study of the properties of antacene derivatives of the herb St. John's wort is an important and urgent task. The properties of this rare group of biologically active substances are still not fully understood. First of all, the content of hypericin and pseudohypericin determines the photosensitizing effect of St. John's wort preparations. This property explains the experience of using St. John's wort for the treatment of vitiligo [2, 3]. Some authors explain the antidepressant effect of raw materials with this particular group of substances, other scientists question this fact [3, 4]. Our studies show that the leading role in the development of the antidepressant effect belongs to flavonoids (hyperoside and bisapigenin), however, it is possible that anthracene derivatives also contribute [3, 10]. Anthracene derivatives of the herb St. John's wort also have antimicrobial and anti-inflammatory effects [3]. It is noted that the anthraquinone derivatives of the herb St. John's wort are characterized by a laxative effect [12]. At the same time, preparations of St. John's wort have astringent effects due to the high content of tannins [3]. The antiviral properties of anthracene derivatives of St. John's wort are also indicated [4, 12]. Hypericin is thought to affect the assembly, multiplication, and release of viruses from cells. For hypericin and pseudohypericin, anticarcinogenic activity was found [4, 12]. Considering such important pharmacological properties inherent in anthracene derivatives of the herb St. John's wort, it becomes obvious that it is necessary to analyze this group of substances. Many authors are inclined to this opinion [3, 6, 7, 12, 13]. Therefore, it is advisable to analyze raw materials and preparations not only for flavonoids, but also for the amount of anthracene derivatives [5, 6, 14]. that anthraquinone derivatives of the herb St. John's wort are characterized by a laxative effect [12]. At the same time, preparations of St. John's wort have astringent effects due to the high content of tannins [3]. The antiviral properties of anthracene derivatives of St. John's wort are also indicated [4, 12]. Hypericin is thought to affect the assembly, multiplication, and release of viruses from cells. For hypericin and pseudohypericin, anticarcinogenic activity was found [4, 12]. Considering such important pharmacological properties inherent in anthracene derivatives of the herb St. John's wort, it becomes obvious that it is necessary to analyze this group of substances. Many authors are inclined to this opinion [3, 6, 7, 12, 13]. Therefore, it is advisable to analyze raw materials and preparations not only for flavonoids, but also for the amount of anthracene derivatives [5, 6, 14]. that anthraquinone derivatives of the herb St. John's wort are characterized by a laxative effect [12]. At the same time, preparations of St. John's wort have astringent effects due to the high content of tannins [3]. The antiviral properties of anthracene derivatives of St. John's wort are also indicated [4, 12]. Hypericin is thought to affect the assembly, multiplication, and release of viruses from cells. For hypericin and pseudohypericin, anticarcinogenic activity was found [4, 12]. Considering such important pharmacological properties inherent in anthracene derivatives of the herb St. John's wort, it becomes obvious that it is necessary to analyze this group of substances. Many authors are inclined to this opinion [3, 6, 7, 12, 13]. Therefore, it is advisable to analyze raw materials and preparations not only for flavonoids, but also for the amount of anthracene derivatives [5, 6, 14].

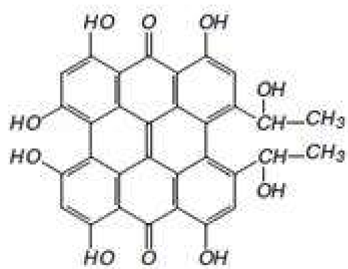
Антраценпроизводные



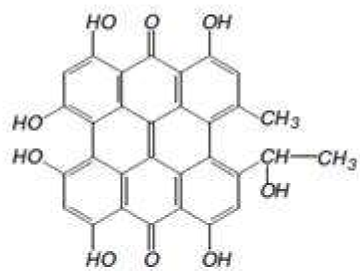
$C_{30}H_{16}O_8$
Гиперицин



$C_{30}H_{16}O_9$
Псевдогиперицин (вар. 1) [4, 5]



$C_{32}H_{20}O_{10}$
Псевдогиперицин (вар. 2) [2]



$C_{31}H_{18}O_9$
Псевдогиперицин (вар. 3) [9]

The results of phytochemical analysis of anthracene derivatives reported in the literature are also ambiguous [3, 5, 6, 7, 8, 13]. Most sources suggest using the thin layer chromatography method as a method of qualitative analysis of raw materials and preparations [3, 13, 14]. In the case of the quantitative determination of anthracene derivatives, the methods of photoelectrocolorimetry and spectrophotometry are used [6]. One of the variants of spectrophotometry, which is most often used by researchers, involves the preliminary purification of St. John's wort from concomitant anthracene derivatives (carotenoids and chlorophylls) using chloroform. This is followed by extraction with acetone, evaporation under vacuum and dissolution of the resulting residue in methanol. In our opinion, all these operations are illogical. After all, the absorption maximum for anthracene derivatives of St. John's wort is 590 ± 1 nm and it does not coincide with the absorption maxima of either carotenoids (usually the maxima are about 425 nm and 475 nm) or chlorophylls (440 nm and 680 nm). Then, extraction is carried out with acetone and, subsequently, the extractant is distilled off, and the precipitate is dissolved in methanol without any filtration step. This approach is advisable if the analysis is carried out by the method of photoelectric colorimetry, which is used to determine the anthracene derivatives. From the point of view of diagnostics, the histochemical reaction to anthracene derivatives in raw materials is also of interest, the extractant is distilled off, and the precipitate is dissolved in methanol without any filtration step. This approach is advisable if the analysis is carried out by the method of photoelectric colorimetry, which is used to determine the anthracene derivatives. From the point of view of diagnostics, the histochemical reaction to anthracene derivatives in raw materials is also of interest, the extractant is distilled off, and the precipitate is dissolved in methanol without any filtration step. This approach is advisable if the analysis is carried out by the method of photoelectric colorimetry, which is used to determine the anthracene derivatives. From the point of view of diagnostics, the histochemical reaction to anthracene derivatives in raw materials is also of interest,

however, this method has not been widely used [7].

A similar technique is used in the ND for the drug "Deprim" containing dry extract of St. John's wort, the quality of which is assessed by the content of anthracene derivatives [14]. The quantitative content of hypericin in the preparation dissolved in methanol is estimated using direct spectrophotometry at a wavelength of 590 nm, and methanol is used as a reference solution. In the method of analysis of the drug "Deprim" to assess the degree of dissolution of tablets, one more maximum for hypericin is used at 335 nm, but it is close to the absorption maxima of flavonoids. It should be noted that this technique involves the use of rare and expensive chemical reagents and equipment that are not widely used in pharmaceutical analysis. In addition, it is quite obvious that this method involves the use of highly toxic reagents, which is undesirable from a security point of view. At the same time, in our country there is an experience of successful replacement in a number of cases of methods of analysis of anthracene derivatives in the herb St. John's wort methanol for ethanol or aqueous ethyl alcohol [13].

It should be noted that the specific absorption rate in the methods of various authors differs significantly. The specific absorption index for a 1% solution in a cuvette with a thickness of 1 cm in this source is given as a value of 718 [14]. So, in some cases, the specific absorption index for a 1% solution of hypericin has a value of 71.8 [15], in others - 870 [13, 16]. Apparently, this discrepancy is due to the fact that the pure hypericin substance was not used in the analysis. This substance also does not appear as a standard. Some authors, apparently for this reason, did not calculate the amount of anthracene derivatives in the feed [7]. Analyzing the available techniques, it can be noted that the analytical wavelength for anthracene derivatives is also different. So, some authors note the value of the maximum absorption of anthracene derivatives 591 nm [3, 7], others - 590 nm [6, 14, 15, 16]. Indicators of the quantitative content of anthracene derivatives in the raw material of St. John's wort also lie within a very wide range - 0.03–0.17%. It is possible that the accumulation of anthracene derivatives is influenced by a large number of environmental factors [1, 3, 4. 8]. However, it is not excluded that the factors mentioned above interfere in the calculation.

It should be noted that at present the analysis of raw materials and preparations (St. John's wort tincture) in the Russian Federation is carried out by the method of differential spectrophotometry only by the content of the sum of flavonoids in terms of rutin. In our opinion, it is advisable to carry out a combined determination of the sum of flavonoids and the sum of anthracene derivatives both in the case of raw materials and preparations of St. John's wort. For this purpose, we have developed an analysis of the sum of anthracene derivatives in terms of hypericin by direct spectrophotometry [11]. However, work on the isolation and purification of anthacene derivatives from the herb St. John's wort should be continued.

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