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ДОСТУПНЫЙ СИНТЕЗ ПРОИЗВОДНЫХ ФЕНОЛОВ, СОДЕРЖАЩИХ ЛАКТАМОМЕТИЛЬНЫЕ ЗАМЕСТИТЕЛИ

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В данной работе нами предложен метод синтеза новых соединений, которые являются производными фенолов, содержащих лактамометильные заместители. Процессы окисления топлив и масел приводят к ухудшению их эксплуатационных свойств, поэтому актуальность работы обусловлена необходимостью поиска эффективных ингибиторов этих процессов. Нами предложена простая система для проведения реакции лактамометилирования. В результате нагревания фенолов (резорцина, флороглюцина, метилфлороглюцина, пирогаллола, салициловой, β-резорциловой и галловой кислот) с N-гидроксиметильными производными пирролидона, валеролактама, капролактама и 4-фенилпирролидона в воде в присутствии каталитических количеств уксусной кислоты были получены целевые продукты с высокими выходами, близкими (для ряда соединений) к количественным. Время реакции составляло 1,5-2 ч. В отличие от реагентов целевые соединения обладают низкой растворимостью в воде, поэтому для выделения продуктов реакции используется фильтрация. К достоинствам метода можно отнести его экологичность, так как используемые реагенты и растворитель малотоксичны, а в процессе синтеза практически не образуется отходов, малое время реакции, а также доступность и дешевизну исходных соединений. Было получено 18 неописанных ранее соединений. Состав всех полученных веществ установлен с помощью элементного анализа, структуры синтезированных соединений доказаны методами ИК-Фурье спектроскопии, ^{1}H- и ^{13}C-ЯМР спектроскопии. В ИК-спектрах продуктов характеристичная полоса поглощения валентных колебаний карбонильной группы (-C=O) смещена в несколько меньшую (около 1600 см$^{-1}$) область по сравнению с ожидаемой. Это обусловлено образованием внутри- и межмолекулярных водородных связей этой группы с гидроксильной группой фенола.

Ключевые слова: органический синтез, фенолы, лактамы, амидометилирование

FACILE SYNTHESIS OF PHENOLIC DERIVATIVES, CONTAINIG LACTAMOMETHYL SUBSTITUENTS

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In this work we suggest the new method for the synthesis of novel phenolic derivatives, containing lactamomethyl substituents. Oxidation processes of fuels and mineral oils lead to losing of their properties, so the search for new and effective inhibitors of these processes is very actuel. We suggest a facile system for lactamomethylation reaction. Heating in the water some of phenols (resorcinol, phloroglucinol, methylphloroglucinol, pyrogallol, salicylic, resorcilic and gallic acids) with N-hydroxymethyl derivatives of pyrrolidone, valerolactam, caprolactam and 4-phenylpyrrolidone in the presence of catalytic amounts of acetic acid led to the target compounds with nearly quantitative yields. Time of the reaction ranged 1.5-2 h. As the products have low solubility in water, in contrast with the reagents, filtration was used for their extraction. The advantages of this method are also that it is eco-friendly because of small amounts of wastes and low toxicity of the reagents and solvent, and cheapness of starting compounds. Eighteen novel compounds were obtained. The composition of target substances was determined by elemental analysis whereas the structures of the synthesized compounds were confirmed by FT-IR spectroscopy methods, ^{1}H- and ^{13}C-NMR spectroscopy. In IR spectra there are carbonyl group stretching vibrations peaks in lower frequencies (about 1600 cm^{-1}) than expected due to the formation of inter- and intramolecular hydrogen bonds between this group and phenolic hydroxyl group.

Key words: organic synthesis, phenols, lactams, amidomethylation

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INTRODUCTION

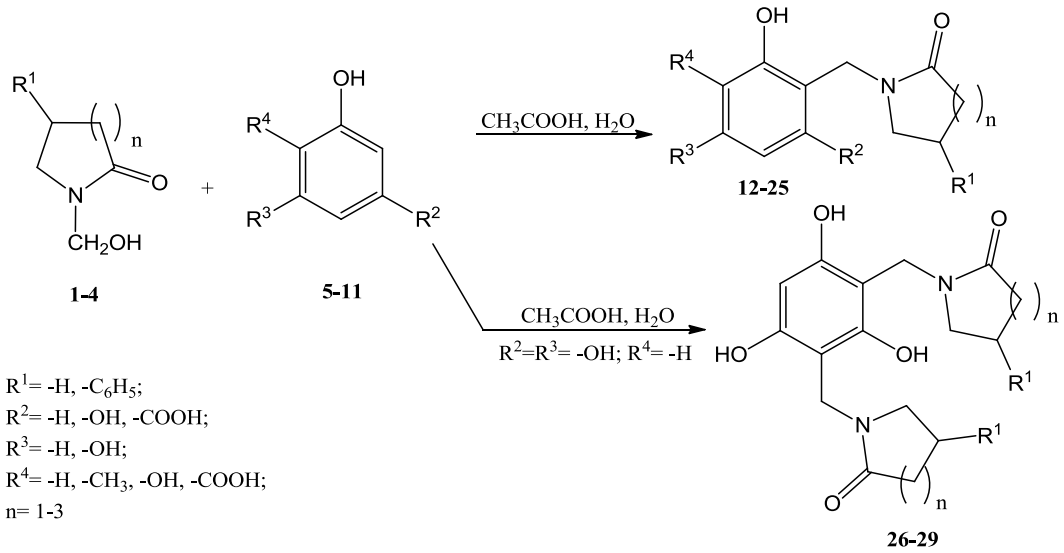
Phenols, the widespread compounds in nature, are important bioactive substances. They reveal [1, 2] anti-inflammatory and antiseptic properties. Due to their antioxidant effect they can struggle against oxidative stress, which considered to be the cause of various diseases [3]. It was estimated that phenols possess antitumor activity against some varieties of cancer [4, 5] and can be used in complex oncology treatment. The most active compounds are polyphenols – resveratrol [6-9], quercetin [10], dihydroquercetin [11, 12], and some others.

Several effective antioxidants were synthesized in previous investigations that had been carried out at the department of Organic and Petroleum Chemistry of Gubkin Russian State University of Oil and Gas (National Research University). They contain the fragment of sterically hindered phenol and heterocyclic substituent [13-15]. The latter may be a lactam, the compounds of great interest due to their wide spectra of bioactivity [16, 17]. However, there are few works dedicated to the synthesis of such compounds [18].

RESULTS AND DISCUSSION

In works [19, 20] we described lactamomethyl derivatives of alkylphenols and diphenolic compounds. Target substances were synthesized according to Tscherniak-Einhorn reaction using chloroform as solvent and trifluoroacetic acid as catalyst with moderate yields (40-60%). We suggest more effective system, "water – acetic acid". Using this procedure we can isolate products by filtration, because the solubility of reagents in water is higher, than one of products. The advantages of this method are also its eco- friendliness, as the reagents and solvent are low-toxic and the synthesis produces small amounts of wastes.

By interaction of N-hydroxymethyl derivatives of pyrrolidone (**1**), valerolactam (**2**), caprolactam (**3**) or 4-phenylpyrrolidone (**4**) with phenols – resorcinol (**5**), phloroglucinol (**6**), methylphloroglucinol (**7**), which synthesis was described in work [21], pyrogallol (**8**), salicylic (**9**), β-resorcilic (**10**) and gallic (**11**) acids – the products of substitution were obtained.



Scheme
Схема

The structure and composition of the products were confirmed by modern methods of physicochemical analyses. Noteworthy, that in IR spectra the carbonyl group (C=O) peaks are in lower frequencies zone (about 1600 cm^{-1}) than expected due to the formation of hydrogen bonds with nearby hydroxyl group of corresponding phenol.

EXPERIMENTAL PART

IR spectra were recorded on an Agilent Carry 600 spectrometer equipped with an attenuated total reflectance (ATR) device. The ^{1}H and ^{13}C NMR spectra were measured at room temperature on Bruker DPX-300 (^{1}H, 300 MHz; ^{13}C, 75 MHz) in DMSO-d6 in a pulse mode followed by Fourier transform and 2H resonance stabilization (RTU). The melting points were determined on a Stuart SMP30 instrument. Elemental analyses were carried out on a Vario MicroCube.

Resorcinol, phloroglucinol, pyrogallol, salicylic and gallic acids, pyrrolidone, valerolacam, caprolactam, 4-phenylpyrrolidone and acetic acid were commercial products (*Acros* and *Sigma-Aldrich*). β-resorcilic acid (**10**), 1-hydroxymethylpyrrolidone-2 (**1**), 1-hydroxymethylpiperidone-2 (**2**), 1-hydroxymethylazepanone-2 (**3**) и 1-hydroxymethyl-4-phenylpyrrolidone-2 (**4**) were synthesized according to corresponding procedures [22, 23]. Constants, yields, elemental analysis data and spectral characteristics are shown in tables 1, 2. For elemental analysis data calculated values are given in the top line, found values are given in bottom line.

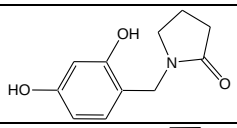
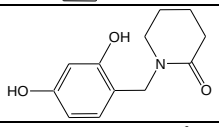
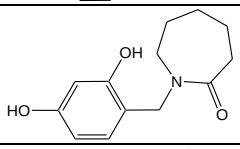
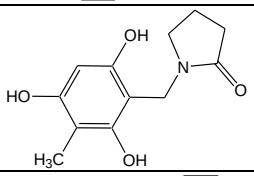
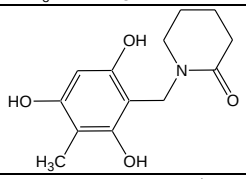
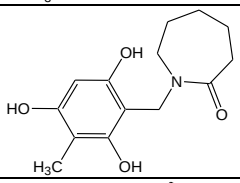
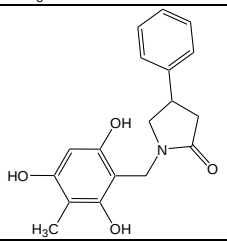
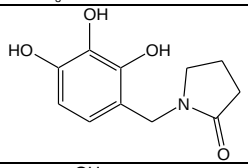
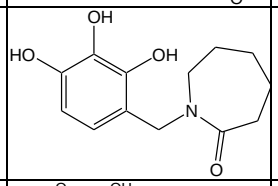
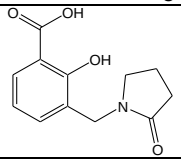
General procedure for preparation of lactamomethyl derivatives of phenols

To a solution of 0.01 mol of corresponding phenol in water (20 ml), 1-hydroxymethyllactam (0.01 mol) and 2 ml of acetic acid were added. The mixture was refluxed for two hours. The solution was allowed to cool; the obtained precipitate was filtered and washed with water.

Table 1

Yields and physical-chemical properties of compounds 12-29

Таблица 1. **Выходы и физико-химические характеристики соединений 12-29**

Com-pound	Structure	m.p., °C	Formula	Composition, %			Yield, %
				C	H	N	
1	2	3	4	5	6	7	8
12		215-217 °C (ethanol)	$C_{11}H_{13}NO_3$	63.75 63.20	6.32 6.34	6.76 6.77	80
13		95-97 °C (ethanol)	$C_{12}H_{15}NO_3$	65.14 64.99	6.83 6.98	6.33 6.79	57
14		110-112 °C (water)	$C_{13}H_{17}NO_3$	66.36 64.63	7.28 7.67	5.95 6.01	60
15		237-238 °C (isopropanol)	$C_{12}H_{15}NO_4$	60.75 60.59	6.37 6.61	5.90 5.93	98
16		210-215 °C (isopropanol)	$C_{13}H_{17}NO_4$	62.14 62.02	6.82 6.97	5.57 5.43	85
17		237-238 °C (isopropanol)	$C_{14}H_{19}NO_4$	63.38 63.20	7.22 7.49	5.28 5.21	95
18		131-133 °C (isopropanol)	$C_{18}H_{19}NO_4$	68.99 68.75	6.11 6.22	4.47 4.43	85
19		235 °C (ethanol)	$C_{11}H_{13}NO_4$	59.19 59.02	5.87 5.98	6.27 6.03	62
20		205 °C (ethanol)	$C_{13}H_{17}NO_4$	62.14 62.02	6.82 6.97	5.57 5.43	79
21		232 °C (ethanol)	$C_{12}H_{13}NO_4$	61.27 61.03	5.57 5.71	5.95 5.88	48

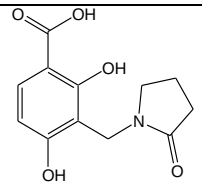
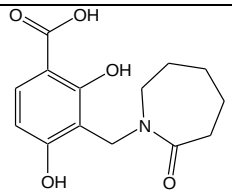
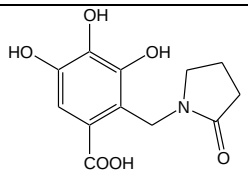
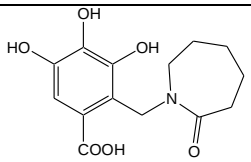
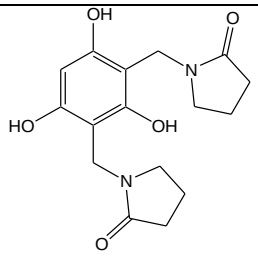
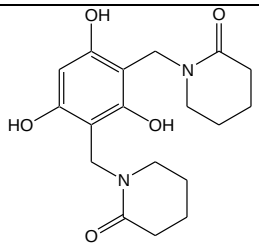
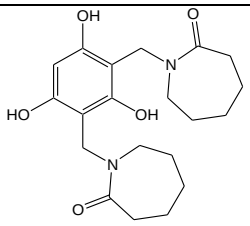
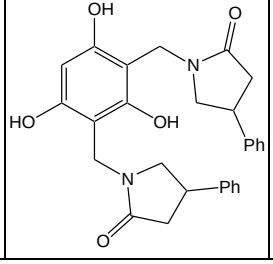
1	2	3	4	5	6	7	8
22		234 °C (ethanol)	$C_{12}H_{13}NO_5$	57.37 57.02	5.22 5.51	5.58 5.51	62
23		170 °C (ethanol)	$C_{14}H_{17}NO_5$	60.21 60.01	6.14 6.28	5.02 5.07	41
24		220 °C (ethanol - ether)	$C_{12}H_{13}NO_6$	53.93 53.51	4.90 5.17	5.26 5.05	53
25		217 °C (ethanol - water)	$C_{14}H_{17}NO_6$	56.94 57.03	5.80 5.91	4.74 4.65	55
26		218 °C (ethanol)	$C_{16}H_{20}N_2O_5$	59.99 59.69	6.29 6.83	8.74 8.24	71
27		147-149 °C (ethanol)	$C_{18}H_{24}N_2O_5$	62.05 61.76	6.94 7.13	8.04 7.96	69
28		230 °C (isopropanol)	$C_{20}H_{28}N_2O_5$	63.81 63.58	7.50 7.66	7.44 7.40	77
29		140-142 °C (isopropanol)	$C_{28}H_{28}N_2O_5$	71.17 71.03	5.97 6.11	5.93 5.88	65

Table 2

Spectral data for compounds 12-29

***Таблица 2*. Спектральные параметры соединений 12-29**

Compound	IR spectrum (solid phase, ν, cm^{-1}), stretching vibrations of C=O group	^{1}H NMR spectrum, δ, ppm, $^{3}J_{HH}$, Hz	^{13}C NMR spectrum, δ, ppm
1	2	3	4
12	1634	1.87 (m, 2H, 4-C CH_2 in lactam); 2.24 (t, 2H, 3-C CH_2 in lactam, J = 7.83); 3.23 (m, 2H, 5-C CH_2 in lactam); 4.19 (s, 2H, N$\underline{CH_2}$Ar); 6.18-6.84 (m, 3H, Ar), 9.20 (bs, 1H, OH); 9.37 (s, 1H, OH).	17.41; 30.48 (2 carbon atoms of lactamic ring); 40.54 (N$\underline{CH_2}$Ar); 46.61 (N$\underline{CH_2}$ in lactam); 102.69; 106.44; 113.55; 130.28; 156.33; 157.85 (6 Ar); 174.32 (C=O)
13	1599	1.67 (m, 4H, 4,5-CH_2 in lactam); 2.26 (m, 2H, 3-C CH_2 in lactam); 3.23 (m, 2H, 6-C CH_2 in lactam); 4.28 (s, 2H, N$\underline{CH_2}$ Ar); 6.16-6.90 (m, 3H, Ar), 9.23 (bs, 1H, OH); 9.70 (bs, 1H, OH).	21.10; 22.89; 32.09 (3 carbon atoms of lactamic ring); 45.70 (N$\underline{CH_2}$Ar); 47.50 (N$\underline{CH_2}$ in lactam); 103.36; 106.75; 114.18; 131.15; 157.00; 158.54 (6 Ar); 170.38 (C=O).
14	1610	1.51-1.66 (m, 6H, 4,5,6-CH_2 in lactam); 2.44 (t, 2H, 3-C CH_2 in lactam, J = 6.83); 3.37 (m, 2H, 7-C CH_2 in lactam); 4.85 (s, 2H, N$\underline{CH_2}$ Ar); 6.16-6.19 (m, 3H, Ar), 9.14 (bs, 2H, OH).	23.48; 28.47; 29.61; 36.81 (4 carbon atoms of lactamic ring); 47.68 (N$\underline{CH_2}$Ar); 56.90 (N$\underline{CH_2}$ in lactam); 102.97; 106.68; 130.16; 158.91 (6 Ar); 176.53 (C=O).
15	1620	1.85 (s, 3H, $\underline{CH_3}$-Ar); 1.92 (p, 2H, 3-$\underline{CH_2}$ in lactam, J = 7.1); 2.28 (t, 2H, C(O)$\underline{CH_2}$, J = 7.68); 3.44 (t, 2H, N$\underline{CH_2}$, J = 6.95); 4.18 (s, 2H, Ar$\underline{CH_2}$); 5.95 (s, 1H, Ar); 8.97 (bs, 1H, OH); 9.12 (bs, 1H, OH); 9.29 (bs, 1H, OH).	8.93 ($\underline{CH_3}$-Ar); 17.88 (4-$\underline{CH_2}$ in lactam); 30.42 (C(O)$\underline{CH_2}$); 36.53 (Ar$\underline{CH_2}$N); 48.50 (N$\underline{CH_2}$ in lactam); 94.58; 102.69; 102.71; 154.49; 155.60; 156.35 (6 Ar); 176.73; (C=O).
16	1622	1.66 (m, 4H, 4,5-CH_2 in lactam); 1.84 (s, 3H, $\underline{CH_3}$-Ar); 2.27 (m, 2H, 3-C CH_2 in lactam); 3.48 (m, 2H, 6-C CH_2 in lactam); 4.26 (s, 2H, N$\underline{CH_2}$Ar); 5.94 (s, 1H, Ar), 9.00 (bs, 1H, OH); 9.21 (bs, 1H, OH); 10.14 (bs, 1H, OH).	8.98 ($\underline{CH_3}$-Ar); 20.77 (4-$\underline{CH_2}$ in lactam); 22.79; 31.66 (C(O)$\underline{CH_2}$); 41.53 (Ar$\underline{CH_2}$N); 48.49 (N$\underline{CH_2}$ in lactam); 94.30; 102.37; 102.53; 154.79; 156.17; 156.48 (6 Ar); 171.73; (C=O).
17	1617	1.51-1.62 (m, 6H, 4,5,6-CH_2 in lactam); 1.84 (s, 3H, $\underline{CH_3}$-Ar); 2.47 (m, 2H, 3-C CH_2 in lactam); 3.59 (m, 2H, 6-C CH_2 in lactam); 4.27 (s, 2H, Ar$\underline{CH_2}$); 5.94 (s, 1H, Ar); 8.94 (bs, 1H, OH); 9.20 (bs, 1H, OH); 9.86 (bs, 1H, OH).	8.94 ($\underline{CH_3}$-Ar); 23.24; 25.96; 27.76; 29.49 (4 carbon atoms of lactamic ring); 36.07 (N$\underline{CH_2}$Ar); 49.89 (N$\underline{CH_2}$ in lactam); 94.37; 102.35; 102.94; 154.52; 155.98; 156.34 (6 Ar); 177.97 (C=O).
18	1637	1.85 (s, 3H, $\underline{CH_3}$-Ar); 2.67-2.77 (m, 2H, 3-C CH_2 in lactam); 3.50-3.59 (m, 2H, 5-C CH_2 in lactam); 3.77-3.88 (m, 1H, 4-C CH in lactam); 4.24 (s, 2H, Ar$\underline{CH_2}$); 5.95 (s, 1H, Ar in phenol); 7.18-7.28 (m, 5H, Ar in lactam); 9.01 (bs, 1H, OH); 9.09 (bs, 1H, OH); 9.51 (bs, 1H, OH).	9.01 ($\underline{CH_3}$-Ar); 36.21; 37.39 (2 carbon atoms of lactamic ring); 39.47 (Ar$\underline{CH_2}$N); 55.43 (N$\underline{CH_2}$ в цикле); 102.61; 102.79; 104.86; 127.28; 127.29; 129.07; 143.04; 154.59; 155.60; 156.44 (12 Ar); 175.39 (C=O).
19	1637	1.86 (p, 2H, 4-C CH_2 in lactam, J = 7.89); 2.23 (t, 2H, 3-C CH_2 in lactam, J = 7.89); 3.24 (t, 2H, 5-C CH_2 in lactam, J = 7.02); 4.18 (s, 2H, N$\underline{CH_2}$Ar); 6.29 (AB-system, 2H, Ar, J = 8.83); 8.59 (bs, 3H, -OH).	17.81 (4-$\underline{CH_2}$ in lactam); 30.84 (C(O)$\underline{CH_2}$); 41.58 (Ar$\underline{CH_2}$N); 47.14 (N$\underline{CH_2}$ in lactam); 107.17; 115.10; 119.59; 133.78; 144.96; 146.10 (6 Ar); 174.98 (C=O).

1	2	3	4
20	1628	1.40-1.59 (m, 6H, 4,5,6-C CH_2 in lactam); 2.45 (m, 2H, 3-C CH_2 in lactam); 3.37 (m, 2H, 7-C CH_2 in lactam); 4.28 (s, 2H, N$\underline{CH_2}$Ph); 6.34 (AB-system, 2H, Ar, J = 7.89); 8.09 (bs, 1H, -OH); 8.67 (bs, 1H, -OH); 9.12 (bs, 1H, -OH).	23.31; 27.93; 29.49; 36.45 (4 carbon atoms of lactamic ring); 47.31 (N$\underline{CH_2}$Ar); 49.08 (N$\underline{CH_2}$ in lactam); 107.14; 115.75; 120.19; 133.84; 144.93; 146.28 (6 Ar); 176.81 (C=O).
21	1745, 1693	1.92 (p, 2H, 4-$\underline{CH_2}$ in lactam, J = 7.60); 2.26 (t, 2H, C(O)$\underline{CH_2}$, J = 7.87); 3.26 (t, 2H, N$\underline{CH_2}$, J = 6.95); 4.36 (s, 2H, Ar$\underline{CH_2}$); 6.86-7.73 (m, 3H, Ar).	17.89 (4-$\underline{CH_2}$ in lactam); 30.66 (C(O)$\underline{CH_2}$); 40.50 (Ar$\underline{CH_2}$N, overlapped by solvent peak); 47.13 (N$\underline{CH_2}$ in lactam); 113.01; 119.26; 125.02; 129.67; 134.88; 159.70 (6 Ar); 172.73; 174.66 (2 C=O).
22	1660, 1610	1.85 (p, 2H, 4-C CH_2 in lactam, J = 7.64); 2.23 (t, 2H, 3-C CH_2 in lactam, J = 8.01); 3.22 (t, 2H, 5-C CH_2 in lactam, J = 7.08); 4.34 (s, 2H, N$\underline{CH_2}$Ar); 6.41-7.63 (AX-system, 2H, Ar, J = 8.75); 10.65 (bs, 2H, -OH); 11.95 (bs, 1H, -COOH).	17.78 (4-$\underline{CH_2}$ in lactam); 30.69 (C(O)$\underline{CH_2}$); 34.86 (Ar$\underline{CH_2}$N); 47.01 (N$\underline{CH_2}$ in lactam); 104.59; 108.35; 109.86; 131.50; 162.55; 163.04 (6 Ar); 172.85; 175.06 (2 C=O).
23	1650, 1575	1.44-1.59 (m, 6H, 4,5,6-C CH_2 in lactam); 2.40 (m, 2H, 3-C CH_2 in lactam); 3.49-3.68 (m, 2H, 7-C CH_2 in lactam); 4.41 (s, 2H, N$\underline{CH_2}$Ph); 6.35-7.62 (AX-система, 2H, Ar, J=8.77).	23.21; 27.75, 29.43; 36.18 (4 carbon atoms of lactamic ring); 40.90 (Ar$\underline{CH_2}$N); 49.52 (N$\underline{CH_2}$ in lactam); 104.63; 109.07; 111.24; 131.68; 162.47; 163.30 (6 Ar); 172.82; 177.83 (2 C=O).
24	1707, 1633	1.87 (p, 2H, 4-$\underline{CH_2}$ in lactam, J = 7.45); 2.27 (t, 2H, C(O)$\underline{CH_2}$, J = 7.87); 3.35 (t, 2H, N$\underline{CH_2}$, J = 6.95); 4.71 (s, 2H, Ar$\underline{CH_2}$); 6.97 (s, 1H, Ar); 8.90 (bs, 1H, OH); 9.21 (bs, 1H, OH); 9.75 (bs, 1H, OH); 12.46 (bs, 1H, COOH).	18.05 (4-$\underline{CH_2}$ in lactam); 30.72 (C(O)$\underline{CH_2}$); 38.42 (Ar$\underline{CH_2}$N); 48.15 (N$\underline{CH_2}$ in lactam); 110.75; 116.42; 121.21; 138.36; 144.99; 145.97 (6 Ar); 168.98; 176.46 (2 C=O).
25	1668, 1588	1.37-1.58 (m, 6H, 4,5,6-CH_2 in lactam); 2.48 (m, 2H, 3-C CH_2 in lactam); 3.46 (m, 2H, 7-C CH_2 in lactam); 4.87 (s, 2H, Ar$\underline{CH_2}$); 6.94 (s, 1H, Ar); 8.80 (bs, 1H, OH); 9.15 (bs, 1H, OH); 10.02 (bs, 1H, OH); 12.52 (bs, 1H, COOH).	23.17; 27.58; 29.32; 36.28 (C(O)$\underline{CH_2}$); 42.23 (Ar$\underline{CH_2}$N); 48.11 (N$\underline{CH_2}$ in lactam); 110.73; 116.36; 121.32; 138.02; 144.92; 146.20 (6 Ar); 169.62; 177.93 (2 C=O).
26	1640	1.90 (p, 4H, 4-C CH_2 in lactam, J = 7.64); 2.27 (t, 4H, 3-C CH_2 in lactam, J = 7.82); 3.40 (m, 4H, 5-C CH_2 in lactam); 4.19 (s, 4H, N$\underline{CH_2}$Ar); 5.94 (s, 1H, Ar); 9.51 (bs, 2H, OH); 9.91 (bs, 1H, OH).	17.89; 30.57 (2 carbon atoms of lactamic ring); 36.36 (N$\underline{CH_2}$Ar); 48.19 (N$\underline{CH_2}$ in lactam); 95.38; 103.20; 156.76; 157.34 (6 Ar); 176.32 (C=O).
27	1613	1.66 (m, 8H, 4,5-C CH_2 in lactam); 2.26 (m, 4H, 3-C CH_2 in lactam); 3.42 (m, 4H, 6-C CH_2 in lactam); 4.27 (s, 4H, N$\underline{CH_2}$Ar); 5.76 (s, 1H, Ar); 9.77 (bs, 2H, OH); 9.91 (bs, 1H, OH).	20.74; 22.80; 31.67 (carbon atoms of lactamic ring); 41.66 (N$\underline{CH_2}$Ar); 48.64 (N$\underline{CH_2}$ in lactam); 95.12; 103.30; 157.93; 158.26 (6 Ar); 171.84 (C=O).

1	2	3	4
28	1606	1.40-1.70 (m, 12H, 4,5,6-C CH_2 in lactam); 2.48 (m, 4H, 3-C CH_2 in lactam); 3.57 (m, 4H, 7-C CH_2 in lactam); 4.29 (s, 4H, N$\underline{CH_2}$Ar); 5.87 (s, 1H, Ar); 9.64 (bs, 1H, -OH); 9.76 (bs, 1H, -OH); 10.49 (bs, 1H, -OH).	23.20; 27.72; 29.43; 36.06 (4 carbon atoms of lactamic ring); 42.26 (N$\underline{CH_2}$Ar); 49.76 (N$\underline{CH_2}$ in lactam); 95.35; 103.57; 156.86; 157.46 (6 Ar); 177.88 (C=O).
29	1622	2.32-2.78 (m, 4H, 3-C CH2 in lactam); 3.20-3.53 (m, 4H, 5-C CH_2 in lactam); 3.66-3.78 (m, 2H, 4-C CH in lactam); 4.27 (s, 4H, N$\underline{CH_2}$Ar); 5.79 (s, 1H, Ar); 7.13-7.31 (m, 10H, Ar); 9.76 (bs, 2H, -OH); 10.00 (bs, 1H, -OH).	37.21; 39.16 (2 carbon atoms of lactamic ring); 40.58 (N$\underline{CH_2}$Ar); 54.90 (N$\underline{CH_2}$ in lactam); 102.85; 127.12; 127.20; 127.22; 129.05; 143.77; 157.34; 162.35 (18 Ar); 174.77 (C=O).

CONCLUSIONS

In this work was suggested the new method of synthesis of lactamomethyl phenolic derivatives. 18 novel compounds were obtained with high yields, their structures were confirmed by physicochemical methods. Thus, target compounds are perspective for further investigation for their biological and antioxidant activities.

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