ISSN 1070-4280, Russian Journal of Organic Chemistry, 2006, Vol. 42, No. 3, pp. 369–375. © Pleiades Publishing, Inc., 2006.
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Synthesis of Schiff Bases from 1-Naphthylamine and Vanillin, Vanillal, and Their *O*-Acyl Derivatives

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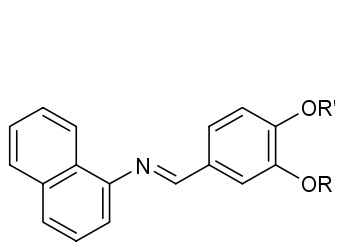
Received January 18, 2005

Abstract—Previously unknown Schiff bases were synthesized by the condensation of 1-naphthylamine with vanillin, vanillal, and their *O*-acyl derivatives in ethanol.

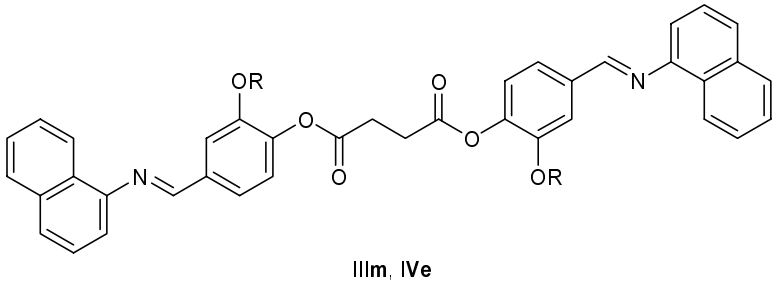
DOI: 10.1134/S1070428006030055

Schiff bases (azomethines) are widely used as biologically active substances, liquid crystals, dyes, luminophores, and polymer stabilizers [1–4]. New efficient antidepressants, anticonvulsants, and antimicrobial, somniferous, psychotropic, nematocide, antiphlogistic, antitumor, and other medical agents have been developed on the basis of azomethines [5, 6]. The presence of a polarized carbon–nitrogen bond in these compounds makes them convenient starting materials in the synthesis of heterocycles [7].

The goal of the present work was to synthesize previously unknown derivatives at the carbonyl group of naturally occurring hydroxy aldehydes, 4-hydroxy-3-methoxybenzaldehyde (vanillin) and 3-ethoxy-4-hydroxybenzaldehyde (vanillal), and esters formed by acylation of the 4-hydroxy group therein. Although Schiff bases have been studied in sufficient detail, only a few published data are available on compounds derived from 1-naphthylamine (in contrast to 2-naphthylamine derivatives [5]). Obviously, the reason is that 1-naphthylamine-based azomethines are difficult to isolate from reaction mixture, for they decompose during purification [6]. We succeeded in obtaining *N*-[4-hydroxy(or acyloxy)-3-methoxy(or ethoxy)phenylmethylidene]-1-naphthylamines **IIIa**–**IIIw** and **IVa**–**IVi** by condensation of vanillin, vanillal, and their 4-*O*-acyl derivatives **I** with 1-naphthylamine (**II**) in 96% ethanol at 20–23°C. The reactions were complete in 20–30 h under mild conditions in the absence of a catalyst, which favored conservation of labile ester groups. Schiff bases **IIIa**–**IIIw** and **IVa**–**IVi** were isolated in 90–95% yield. It should be noted that aldehydes **I** reacted with 1-naphthylamine at a much lower rate than with 2-naphthylamine; in the latter case, the reaction was complete in 5–10 min, and the yield of the corresponding Schiff bases was quantita-



IIIa–IIIw, IVa–IVi



IIIm, IVe

III, R = Me, R' = H (**a**), MeCO (**b**), *i*-PrCO (**c**), $Me(CH_2)_8CO$ (**d**), $Me(CH_2)_{11}CO$ (**e**), $Me(CH_2)_{16}CO$ (**f**), CH_2=CHCO (**g**), CH_2=C(Me)CO (**h**), *cis*-$Me(CH_2)_7CH$=$CH(CH_2)_7CO$ (i), $PhCH_2CO$ (**j**), $PhCH(Me)CH_2CH_2CO$ (**k**), *trans*-PhCH=CHCO (**l**), $BrCH_2CO$ (**n**), PhCO (**o**), 4-MeC_6H_4CO (**p**), 2-ClC_6H_4CO (**q**), 4-ClC_6H_4CO (**r**), 2,4-$Cl_2C_6H_3CO$ (**s**), 4-BrC_6H_4CO (**t**), 2,4-Cl_2-$C_6H_3OCH_2CO$ (**u**), 3-$O_2NC_6H_4CO$ (**v**), 4-$O_2NC_6H_4CO$ (**w**); **IV**, R = Et, R' = H (**a**), MeCO (**b**), PrCO (**c**), *i*-PrCO (**d**), PhCO (**f**), 4-MeC_6H_4CO (**g**), 2-ClC_6H_4CO (**h**), 4-ClC_6H_4CO (**i**).

tive. Compounds **IIIa**–**IIIw** and **IVa**–**IVi** are promising as accessible synthons for the preparation of heterocycles via reactions with CH acids, as well as for the synthesis of polysubstituted acridinones (analogs of plant alkaloids) [7] and other purposes.

The structure of Schiff bases **IIIa**–**IIIw** and **IVa**–**IVi** was confirmed by elemental analysis, cryoscopic molecular weight determination, and ^{1}H NMR, IR, and UV spectroscopy. According to the ^{1}H NMR data, the isolated products were *E* isomers with a purity of 98±1%.

EXPERIMENTAL

The IR spectra were recorded in KBr on a Nicolet Protege-460 Fourier spectrometer. The UV spectra were measured from 10^{-4} M solutions in methanol on a Specord UV-Vis spectrophotometer. The ^{1}H NMR spectra were obtained on a Tesla BS-587A spectrometer (100 MHz) from 5% solutions in $CDCl_3$ using octamethyltrisiloxane as internal reference. The molecular weights were determined by cryoscopy in benzene. Initial vanillin and vanillal esters **I** were synthesized by the procedures described in [8, 9].

Schiff bases IIIa–IIIw and IVa–IVi (*general procedure***).** Carbonyl compound **I**, 0.01 mol, was dissolved in 50–100 ml of 96% ethanol, 0.01 mol (or 0.02 mol in the synthesis of **IIIm** and **IVe**) of 1-naphthylamine (**II**) was added, and the resulting solution was left to stand for 20–30 h at 20–23°C. The precipitate of Schiff base **IIIa**–**IIIw** or **IVa**–**IVi** was filtered off through a glass filter, washed with a small amount of 96% ethanol, and dried under reduced pressure. The products were sufficiently pure, and no additional purification (e.g., by recrystallization) was necessary.

2-Methoxy-4-(1-naphthyliminomethyl)phenol (IIIa). Yield 92%, mp 153–154°C. IR spectrum, ν, cm^{-1}: 3450 (OH), 3049, 3007 (=C–H, C–H_{arom}), 2958, 2933, 2852 (C–H_{aliph}), 1624 (C=N), 1597, 1569, 1509, 1461, 1428, 1398, 1376 (C–C_{arom}), 1284, 1263, 1204, 1191, 1157, 1146, 1119, 1076, 1064, 1029 (C–O), 862, 817, 790, 765, 756 (δC–H_{arom}). UV spectrum, λ_{max}, nm (ε): 210 (28000), 230 (25000), 260 (10000), 290 (7000), 310 (6000), 350 (5000). ^{1}H NMR spectrum, δ, ppm: 4.03 s (CH_3O), 6.60 br.s (OH), 6.95–8.45 m (C_6H_3, $C_{10}H_7$), 8.45 s (N=CH). Found, %: C 78.23; H 5.66; N 4.78. *M* 264.1. $C_{18}H_{15}NO_2$. Calculated, %: C 77.96; H 5.45; N 5.05. *M* 277.3.

2-Methoxy-4-(1-naphthyliminomethyl)phenyl acetate (IIIb). Yield 93%, mp 147–148°C. IR spectrum, ν, cm^{-1}: 3060, 3041, 3013 (=C–H, C–H_{arom}), 2991, 2948, 2917, 2882, 2851 (C–H_{aliph}), 1760 (C=O), 1625 (C=N), 1599, 1568, 1500, 1465, 1417, 1395, 1362 (C–C_{arom}), 1277, 1265, 1213, 1189, 1170, 1157, 1145, 1122, 1082, 1032, 1013, 971, 906 (C–O), 878, 843, 815, 799, 781, 767, 727, 669 (δC–H_{arom}). UV spectrum, λ_{max}, nm (ε): 209 (27000), 229 (26000), 260 (9000), 290 (6000), 310 (6000), 345 (5000). ^{1}H NMR spectrum, δ, ppm: 2.38 s (CH_3CO), 3.98 s (CH_3O), 6.95–8.45 m (C_6H_3, $C_{10}H_7$), 8.50 s (N=CH). Found, %: C 75.47; H 5.65; N 4.07. *M* 307.5. $C_{20}H_{17}NO_3$. Calculated, %: C 75.22; H 5.37; N 4.39. *M* 319.4.

2-Methoxy-4-(1-naphthyliminomethyl)phenyl 2-methylpropanoate (IIIc). Yield 90%, mp 85–86°C. IR spectrum, ν, cm^{-1}: 3080, 3050, 3010 (=C–H, C–H_{arom}), 2971, 2934, 2874 (C–H_{aliph}), 1759 (C=O), 1627 (C=N), 1600, 1589, 1506, 1466, 1417, 1387, 1360 (C–C_{arom}), 1266, 1234, 1201, 1180, 1158, 1122, 1090, 1033 (C–O), 864, 790, 764, 685, 655 (δC–H_{arom}). UV spectrum, λ_{max}, nm (ε): 209 (28000), 229 (27000), 260 (9000), 290 (6000), 310 (6000), 347 (5000). ^{1}H NMR spectrum, δ, ppm (*J*, Hz): 1.37 d [$(CH_3)_2C$, ^3J = 7.4], 2.90 quint (CH, ^3J = 7.4), 3.97 s (CH_3O), 6.95–8.35 m (C_6H_3, $C_{10}H_7$), 8.50 s (N=CH). Found, %: C 76.28; H 6.27; N 3.94. *M* 326.7. $C_{22}H_{21}NO_3$. Calculated, %: C 76.06; H 6.09; N 4.03. *M* 347.4.

2-Methoxy-4-(1-naphthyliminomethyl)phenyl decanoate (IIId). Yield 91%, mp 37–38°C. IR spectrum, ν, cm^{-1}: 3060, 3049, 3005 (=C–H, C–H_{arom}), 2953, 2926, 2854 (C–H_{aliph}), 1764 (C=O), 1627 (C=N), 1600, 1590, 1571, 1506, 1464, 1417, 1394, 1363 (C–C_{arom}), 1280, 1264, 1227, 1197, 1170, 1155, 1139, 1120, 1035, 1015 (C–O), 880, 869, 805, 793, 776, 725, 710, 650 (δC–H_{arom}). UV spectrum, λ_{max}, nm (ε): 209 (26000), 229 (26000), 260 (8000), 290 (6000), 310 (6000), 350 (4000). ^{1}H NMR spectrum, δ, ppm (*J*, Hz): 0.90 t (CH_3, ^3J = 5.4), 1.25–1.55 m (12H, CH_2), 1.88 t (CH_2, ^3J = 5.4), 2.65 t (CH_2CO, ^3J = 7.4), 3.96 s (CH_3O), 6.90–8.40 m (C_6H_3, $C_{10}H_7$), 8.49 s (N=CH). Found, %: C 78.19; H 7.96; N 2.98. *M* 409.9. $C_{28}H_{33}NO_3$. Calculated, %: C 77.93; H 7.71; N 3.25. *M* 431.6.

2-Methoxy-4-(1-naphthyliminomethyl)phenyl tridecanoate (IIIe). Yield 92%, mp 25–26°C. IR spectrum, ν, cm^{-1}: 3060, 3049, 3006 (=C–H, C–H_{arom}), 2954, 2922, 2852 (C–H_{aliph}), 1763 (C=O), 1627 (C=N), 1599, 1572, 1508, 1464, 1417, 1377 (C–C_{arom}), 1287, 1277, 1264, 1227, 1197, 1157, 1144, 1120, 1035, 1015 (C–O), 880, 868, 790, 771, 721, 708, 653 (δC–H_{arom}).

UV spectrum, λ_{max}, nm (ε): 209 (27000), 229 (26000), 260 (8000), 290 (6000), 310 (6000), 350 (4000). ^{1}H NMR spectrum, δ, ppm (*J*, Hz): 0.89 t (CH_3, ^3J = 4.9), 1.15–2.00 m (20H, CH_2), 2.66 t (CH_2CO, ^3J = 7.3), 3.96 s (CH_3O), 6.90–8.40 m (C_6H_3, $C_{10}H_7$), 8.49 s (N=CH). Found, %: C 78.91; H 8.44; N 2.73. *M* 450.1. $C_{31}H_{39}NO_3$. Calculated, %: C 78.61; H 8.30; N 2.96. *M* 473.7.

2-Methoxy-4-(1-naphthyliminomethyl)phenyl octadecanoate (IIIf). Yield 90%, mp 28–29°C. IR spectrum, ν, cm^{-1}: 3060, 3050, 3005 (=C–H, C–H_{arom}), 2955, 2923, 2851 (C–H_{alipf}), 1764 (C=O), 1627 (C=N), 1600, 1572, 1508, 1465, 1417, 1377 (C–C_{arom}), 1287, 1278, 1264, 1227, 1197, 1157, 1144, 1121, 1035, 1015 (C–O), 880, 868, 790, 773, 720, (δC–H_{arom}). UV spectrum, λ_{max}, nm (ε): 209 (26000), 230 (26000), 260 (8000), 290 (5000), 310 (5000), 350 (4000). ^{1}H NMR spectrum, δ, ppm (*J*, Hz): 0.88 t (CH_3, ^3J = 4.7), 1.15–2.05 m (30H, CH_2), 2.68 t (CH_2CO, ^3J = 7.3), 3.96 s (CH_3O), 6.90–8.40 m (C_6H_3, $C_{10}H_7$), 8.48 s (N=CH). Found, %: C 79.83; H 9.23; N 2.34. *M* 521.5. $C_{36}H_{49}NO_3$. Calculated, %: C 79.52; H 9.08; N 2.58. *M* 543.8.

2-Methoxy-4-(1-naphthyliminomethyl)phenyl prop-2-enoate (IIIg). Yield 90%, mp 65–66°C. IR spectrum, ν, cm^{-1}: 3055, 3008 (=C–H, C–H_{arom}), 2968, 2938, 2915, 2874, 2845 (C–H_{aliph}), 1760 (C=O), 1628 (C=N, C=C), 1600, 1571, 1507, 1417, 1403, 1364 (C–C_{arom}), 1295, 1280, 1265, 1246, 1228, 1198, 1145, 1033, 1016 (C–O), 871, 835, 793, 775, 673 (δC–H_{arom}). UV spectrum, λ_{max}, nm (ε): 210 (32000), 220 (14000), 230 (28000), 260 (11000), 290 (5000), 310 (6000), 350 (4000). ^{1}H NMR spectrum, δ, ppm: 3.97 s (CH_3O), 5.85–7.00 m ($CH=CH_2$), 6.90–8.40 m (C_6H_3, $C_{10}H_7$), 8.49 s (N=CH). Found, %: C 76.34; H 5.35; N 3.88. *M* 318.7. $C_{21}H_{17}NO_3$. Calculated, %: C 76.12; H 5.17; N 4.23. *M* 331.4.

2-Methoxy-4-(1-naphthyliminomethyl)phenyl 2-methylprop-2-enoate (IIIh). Yield 90%, mp 74–75°C. IR spectrum, ν, cm^{-1}: 3100, 3085, 3049, 3010 (=C–H, C–H_{arom}), 2980, 2964, 2937, 2870, 2845 (C–H_{aliph}), 1738 (C=O), 1627 (C=N), 1599, 1589, 1570, 1506, 1463, 1417, 1396, 1363, 1316 (C–C_{arom}), 1292, 1280, 1264, 1227, 1201, 1158, 1124, 1079, 1033, 1014 (C–O), 874, 793, 777, 735, 660 (δC–H_{arom}). UV spectrum, λ_{max}, nm (ε): 210 (34000), 229 (28000), 260 (9000), 290 (6000), 310 (6000), 345 (5000). ^{1}H NMR spectrum, δ, ppm (*J*, Hz): 2.13 t (CH_3, ^3J = 0.9), 3.97 s (CH_3O), 5.83 t (=CH, ^3J = 1.1), 6.42 t (=CH, ^3J = 0.9), 6.92–8.45 m (C_6H_3, $C_{10}H_7$), 8.49 s (N=CH). Found, %: C 76.87; H 5.80; N 3.81. *M* 322.0. $C_{22}H_{19}NO_3$. Calculated, %: C 76.50; H 5.54; N 4.06. *M* 345.4.

2-Methoxy-4-(1-naphthyliminomethyl)phenyl (*Z*)-octadec-9-enoate (IIIi). Yield 91%, mp 32–33°C. IR spectrum, ν, cm^{-1}: 3060, 3005 (=C–H, C–H_{arom}), 2925, 2853 (C–H_{aliph}), 1764 (C=O), 1627 (C=N), 1600, 1587, 1572, 1507, 1464, 1417, 1396, 1363 (C–C_{arom}), 1280, 1264, 1227, 1197, 1160, 1145, 1120, 1036 (C–O), 880, 865, 792, 773, 720 (δC–H_{arom}). UV spectrum, λ_{max}, nm (ε): 210 (34000), 229 (28000), 260 (9000), 290 (6000), 310 (6000), 345 (5000). ^{1}H NMR spectrum, δ, ppm (*J*, Hz): 0.90 t (CH_3, ^3J = 4.7), 1.08–2.20 m (22H, CH_2), 2.65 t (CH_2CO, ^3J = 6.0), 3.97 s (CH_3O), 5.40 t (2H, CH=CH, ^3J = 4.2), 6.90–8.45 m (C_6H_3, $C_{10}H_7$), 8.48 s (N=CH). Found, %: C 80.06; H 9.03; N 2.33. *M* 525.7. $C_{36}H_{47}NO_3$. Calculated, %: C 79.81; H 8.74; N 2.59. *M* 541.8.

2-Methoxy-4-(1-naphthyliminomethyl)phenyl phenylacetate (IIIj). Yield 93%, mp 93–94°C. IR spectrum, ν, cm^{-1}: 3090, 3065, 3045, 3020, 3010 (=C–H, C–H_{arom}), 2970, 2930, 2915, 2890, 2880, 2845, 2820 (C–H_{aliph}), 1760 (C=O), 1626 (C=N), 1596, 1580, 1565, 1506, 1460, 1454, 1416, 1397, 1350 (C–C_{arom}), 1278, 1263, 1235, 1215, 1196, 1126, 1118, 1079, 1028 (C–O), 870, 830, 815, 795, 779, 771, 760, 733, 699, 660 (δC–H_{arom}). UV spectrum, λ_{max}, nm (ε): 209 (34000), 230 (29000), 260 (8000), 290 (6000), 310 (6000), 350 (5000). ^{1}H NMR spectrum, δ, ppm: 3.88 s (CH_2), 3.98 s (CH_3O), 6.90–8.40 m (C_6H_3, C_6H_5, $C_{10}H_7$), 8.52 s (N=CH). Found, %: C 79.17; H 5.49; N 3.38. *M* 380.1. $C_{26}H_{21}NO_3$. Calculated, %: C 78.94; H 5.35; N 3.54. *M* 395.5.

2-Methoxy-4-(1-naphthyliminomethyl)phenyl 3-phenylbutanoate (IIIk). Yield 93%, mp 55–56°C. IR spectrum, ν, cm^{-1}: 3090, 3058, 3028, 3004 (=C–H, C–H_{arom}), 2965, 2936, 2910, 2872, 2847 (C–H_{aliph}), 1761 (C=O), 1627 (C=N), 1600, 1590, 1571, 1505, 1470, 1453, 1417, 1395, 1363, 1340 (C–C_{arom}), 1290, 1280, 1264, 1228, 1197, 1160, 1140, 1130, 1122, 1080, 1034, 1017 (C–O), 880, 870, 835, 810, 792, 777, 701, 685, 750 (δC–H_{arom}). UV spectrum, λ_{max}, nm (ε): 208 (35000), 230 (30000), 260 (8000), 290 (5000), 310 (5000), 350 (5000). ^{1}H NMR spectrum, δ, ppm (*J*, Hz): 1.47 d (CH_3, ^3J = 7.5), 2.95 d (CH_2, ^3J = 7.5), 3.44 q (CH, ^3J = 7.5), 3.97 s (CH_3O), 6.90–8.40 m (C_6H_3, C_6H_5, $C_{10}H_7$), 8.52 s (N=CH). Found, %: C 79.68; H 6.12; N 3.07. *M* 406.9. $C_{28}H_{25}NO_3$. Calculated, %: C 79.41; H 5.95; N 3.31. *M* 423.5.

2-Methoxy-4-(1-naphthyliminomethyl)phenyl (*E*)-3-phenylprop-2-enoate (IIIl). Yield 90%,

mp 103–104°C. IR spectrum, ν, cm^{-1}: 3090, 3080, 3060, 3040, 3015, 3005 (=C–H, C–H_{arom}), 2960, 2940, 2915, 2890, 2840, 2825 (C–H_{aliph}), 1730 (C=O), 1634 (C=C), 1626 (C=N), 1607, 1580, 1510, 1490, 1465, 1451, 1420, 1374, 1334 (C–C_{arom}), 1308, 1282, 1272, 1198, 1137, 1120, 1091, 1071, 1028 (C–O), 867, 858, 766, 750, 705, 680 (δC–H_{arom}). UV spectrum, λ_{max}, nm (ε): 207 (50000), 223 (50000), 274 (45000), 290 (12000), 310 (8000), 348 (6000). ^{1}H NMR spectrum, δ, ppm: 3.98 s (CH_3O), 6.80–8.45 m (CH=CH, C_6H_3, C_6H_5, $C_{10}H_7$), 8.53 s (N=CH). Found, %: C 80.03; H 5.27; N 3.16. *M* 394.1. $C_{27}H_{21}NO_3$. Calculated, %: C 79.59; H 5.19; N 3.44. *M* 407.5.

Bis[2-Methoxy-4-(1-naphthyliminomethyl)-phenyl] butane-1,4-dioate (IIIm). Yield 92%, mp 178–179°C. IR spectrum, ν, cm^{-1}: 3090, 3080, 3045, 3015 (=C–H, C–H_{arom}), 2958, 2937, 2920, 2880, 2845, 2820 (C–H_{aliph}), 1755 (C=O), 1627 (C=N), 1600, 1573, 1504, 1423, 1415, 1398, 1364 (C–C_{arom}), 1303, 1280, 1262, 1228, 1192, 1149, 1111, 1078, 1032, 1011 (C–O), 880, 865, 830, 810, 800, 782, 762, 730, 680, 650 (δC–H_{arom}). UV spectrum, λ_{max}, nm (ε): 209 (52000), 230 (50000), 260 (17000), 288 (10000), 310 (11000), 345 (9000). ^{1}H NMR spectrum, δ, ppm: 3.11 s (CH_2CH_2), 3.98 s (CH_3O), 6.97–8.35 m (C_6H_3, $C_{10}H_7$), 8.51 s (N=CH). Found, %: C 75.64; H 5.18; N 4.19. *M* 611.0. $C_{40}H_{32}N_2O_6$. Calculated, %: C 75.46; H 5.07; N 4.40. *M* 636.7.

2-Methoxy-4-(1-naphthyliminomethyl)phenyl bromoacetate (IIIn). Yield 90%, mp 78–79°C. IR spectrum, ν, cm^{-1}: 3080, 3060, 3045, 3005 (=C–H, C–H_{arom}), 2980, 2950, 2920, 2880, 2850 (C–H_{aliph}), 1765 (C=O), 1625 (C=N), 1597, 1569, 1504, 1414, 1396, 1360 (C–C_{arom}), 1457 (CH_2), 1316, 1277, 1263, 1225, 1190, 1159, 1144, 1112, 1079, 1028 (C–O), 875, 850, 820, 805, 771, 758, 680, 620 (δC–H_{arom}), 540 (C–Br). UV spectrum, λ_{max}, nm (ε): 208 (28000), 229 (27000), 260 (9000), 290 (6000), 310 (6000), 345 (5000). ^{1}H NMR spectrum, δ, ppm: 3.98 s (CH_3O), 4.42 s (CH_2), 6.90–8.45 m (C_6H_3, $C_{10}H_7$), 8.50 s (N=CH). Found, %: C 60.49; H 4.19; Br 19.75; N 3.38. *M* 381.8. $C_{20}H_{16}BrNO_3$. Calculated, %: C 60.32; H 4.05; Br 20.06; N 3.52. *M* 398.3.

2-Methoxy-4-(1-naphthyliminomethyl)phenyl benzoate (IIIo). Yield 95%, mp 110–111°C. IR spectrum, ν, cm^{-1}: 3090, 3059, 3043, 3034, 3005 (=C–H, C–H_{arom}), 2960, 2922, 2880, 2852, 2824 (CH_{aliph}), 1729 (C=O), 1629 (C=N), 1595, 1574, 1507, 1470, 1450, 1417, 1396, 1365 (C–C_{arom}), 1314, 1282, 1265, 1201, 1169, 1144, 1128, 1083, 1066, 1036, 1025 (C–O), 860, 807, 791, 777, 762, 698, 682, 652, 619 (δC–H_{arom}). UV spectrum, λ_{max}, nm (ε): 207 (42000), 224 (40000), 260 (20000), 290 (9000), 310 (7000), 345 (5000). ^{1}H NMR spectrum, δ, ppm: 3.98 s (CH_3O), 6.60–8.45 m (C_6H_3, C_6H_5, $C_{10}H_7$), 8.55 s (=CH). Found, %: C 79.04; H 5.16; N 3.39. *M* 368.2. $C_{25}H_{19}NO_3$. Calculated, %: C 78.72; H 5.02; N 3.67. *M* 381.4.

2-Methoxy-4-(1-naphthyliminomethyl)phenyl 4-methylbenzoate (IIIp). Yield 93%, mp 94–95°C. IR spectrum, ν, cm^{-1}: 3080, 3065, 3040, 3030, 3005 (=C–H, C–H_{arom}), 2960, 2940, 2920, 2880, 2845, 2830 (C–H_{aliph}), 1737 (C=O), 1625 (C=N), 1602, 1586, 1571, 1513, 1464, 1447, 1415, 1390 (C–C_{arom}), 1310, 1289, 1262, 1250, 1199, 1172, 1160, 1114, 1059, 1032, 1017 (C–O), 880, 860, 840, 815, 791, 775, 745, 720, 680 (δC–H_{arom}). UV spectrum, λ_{max}, nm (ε): 208 (43000), 226 (35000), 255 (26000), 290 (8000), 310 (7000), 350 (4000). ^{1}H NMR spectrum, δ, ppm: 2.51 s (CH_3), 3.98 s (CH_3O), 6.70–8.45 m (C_6H_3, C_6H_4, $C_{10}H_7$), 8.54 s (N=CH). Found, %: C 79.12; H 5.45; N 3.37. *M* 380.5. $C_{26}H_{21}NO_3$. Calculated, %: C 78.94; H 5.35; N 3.54. *M* 395.5.

2-Methoxy-4-(1-naphthyliminomethyl)phenyl 2-chlorobenzoate (IIIq). Yield 92%, mp 78–79°C. IR spectrum, ν, cm^{-1}: 3090, 3060, 3008 (=C–H, C–H_{arom}), 2980, 2945, 2925, 2870, 2850 (C–H_{aliph}), 1743 (C=O), 1627 (C=N), 1599, 1587, 1569, 1510, 1460, 1450, 1430, 1415, 1390, 1350 (C–C_{arom}), 1313, 1293, 1266, 1243, 1229, 1193, 1161, 1138, 1111, 1094, 1032, 1015 (C–O), 885, 870, 794, 776, 744, 707, 685, 640 (δC–H_{arom}), 560 (C–Cl). UV spectrum, λ_{max}, nm (ε): 208 (35000), 220 (31000), 227 (30000), 258 (13000), 290 (7000), 310 (6000), 350 (4000). ^{1}H NMR spectrum, δ, ppm: 3.98 s (CH_3O), 6.74–8.47 m (C_6H_3, C_6H_4, $C_{10}H_7$), 8.55 s (N=CH). Found, %: C 72.37; H 4.36; Cl 8.21; N 3.11. *M* 397.6. $C_{25}H_{18}ClNO_3$. Calculated, %: C 72.20; H 4.36; Cl 8.52; N 3.37. *M* 415.9.

2-Methoxy-4-(1-naphthyliminomethyl)phenyl 4-chlorobenzoate (IIIr). Yield 94%, mp 132–133°C. IR spectrum, ν, cm^{-1}: 3080, 3060, 3050, 3040, 3005 (=C–H, C–H_{arom}), 2970, 2920, 2880, 2850, 2825 (C–H_{aliph}), 1732 (C=O), 1628 (C=N), 1595, 1577, 1506, 1485, 1465, 1418, 1405, 1397, 1360 (C–C_{arom}), 1310, 1285, 1270, 1201, 1188, 1160, 1150, 1144, 1133, 1095, 1078, 1034, 1016 (C–O), 880, 870, 845, 807, 795, 778, 763, 748, 680, 645, 620 (δC–H_{arom}), 520 (C–Cl). UV spectrum, λ_{max}, nm (ε): 207 (42000), 220 (30000), 228 (28000), 256 (15000), 290 (6000), 308 (7000), 350 (4000). ^{1}H NMR spectrum, δ, ppm: 3.98 s (CH_3O), 6.74–8.47 m (C_6H_3, C_6H_4, $C_{10}H_7$), 8.56 s

(N=CH). Found, %: C 72.33; H 4.47; Cl 8.36; N 3.18. *M* 402.2. $C_{25}H_{18}ClNO_3$. Calculated, %: C 72.20; H 4.36; Cl 8.52; N 3.37. *M* 415.9.

2-Methoxy-4-(1-naphthyliminomethyl)phenyl 2,4-dichlorobenzoate (IIIs). Yield 92%, mp 130–131°C. IR spectrum, ν, cm^{-1}: 3097, 3077, 3065, 3044, 3012 (=C–H, C–H_{arom}), 2980, 2940, 2920, 2880, 2845, 2825 (C–H_{aliph}), 1745 (C=O), 1625 (C=N), 1587, 1570, 1550, 1507, 1468, 1448, 1417, 1395, 1374, 1360 (C–C_{arom}), 1315, 1280, 1263, 1236, 1196, 1169, 1149, 1124, 1086, 1031, 1015 (C–O), 877, 865, 825, 800, 772, 760, 720, 680, 655, 620 (δC–H_{arom}), 570, 545 (C–Cl). UV spectrum, λ_{max}, nm (ε): 211 (50000), 230 (30000), 258 (15000), 290 (7000), 310 (7000), 348 (5000). ^{1}H NMR spectrum, δ, ppm: 3.98 s (CH_3O), 6.75–8.60 m (C_6H_3, $C_{10}H_7$), 8.56 s (N=CH). Found, %: C 66.94; H 3.82; Cl 15.32; N 2.89. *M* 433.1. $C_{25}H_{17}Cl_2NO_3$. Calculated, %: C 66.68; H 3.80; Cl 15.75; N 3.11. *M* 450.3.

2-Methoxy-4-(1-naphthyliminomethyl)phenyl 4-bromobenzoate (IIIt). Yield 90%, mp 139–140°C. IR spectrum, ν, cm^{-1}: 3080, 3060, 3050, 3040, 3005 (=C–H, C–H_{arom}), 2970, 2920, 2880, 2850, 2830 (C–H_{aliph}), 1732 (C=O), 1628 (C=N), 1592, 1576, 1507, 1485, 1465, 1420, 1397, 1365 (C–C_{arom}), 1310, 1285, 1266, 1202, 1145, 1132, 1076, 1035, 1012 (C–O), 880, 870, 855, 807, 795, 780, 765, 745, 680, 620 (δC–H_{arom}), 560 (C–Br). UV spectrum, λ_{max}, nm (ε): 207 (42000), 225 (32000), 258 (30000), 290 (9000), 310 (7000), 345 (5000). ^{1}H NMR spectrum, δ, ppm: 3.98 s (CH_3O), 6.75–8.45 m (C_6H_3, C_6H_4, $C_{10}H_7$), 8.56 s (N=CH). Found, %: C 65.42; H 4.08; Br 17.14; N 2.87. *M* 447.7. $C_{25}H_{18}BrNO_3$. Calculated, %: C 65.23; H 3.94; Br 17.36; N 3.04. *M* 460.3.

2-Methoxy-4-(1-naphthyliminomethyl)phenyl 2-(2,4-dichlorophenoxy)acetate (IIIu). Yield 94%, mp 115–116°C. IR spectrum, ν, cm^{-1}: 3095, 3065, 3020 (=C–H, C–H_{arom}), 2955, 2925, 2910, 2880, 2850, 2820 (C–H_{aliph}), 1795 (C=O), 1627 (C=N), 1597, 1565, 1507, 1482, 1459, 1435, 1417, 1396, 1370 (C–C_{arom}), 1295, 1282, 1265, 1230, 1201, 1179, 1169, 1150, 1146, 1118, 1103, 1080, 1031 (C–O), 870, 840, 815, 800, 778, 766, 730, 715, 700, 790, 760 (δC–H_{arom}), 580, 550 (C–Cl). UV spectrum, λ_{max}, nm (ε): 208 (44000), 228 (28000), 260 (8000), 292 (7000), 310 (6000), 350 (4000). ^{1}H NMR spectrum, δ, ppm: 3.97 s (CH_3O), 5.04 s (CH_2), 6.75–8.45 m (C_6H_3, $C_{10}H_7$), 8.55 s (N=CH). Found, %: C 65.18; H 4.11; Cl 14.45; N 2.71. *M* 462.3. $C_{26}H_{19}Cl_2NO_4$. Calculated, %: C 65.01; H 3.99; Cl 14.76; N 2.92. *M* 480.3.

2-Methoxy-4-(1-naphthyliminomethyl)phenyl 3-nitrobenzoate (IIIv). Yield 93%, mp 157–158°C. IR spectrum, ν, cm^{-1}: 3110, 3090, 3060, 3040, 3030, 3007 (=C–H, C–H_{arom}), 2990, 2955, 2920, 2900, 2980, 2945 (C–H_{aliph}), 1742 (C=O), 1628 (C=N), 1615, 1604, 1587, 1570, 1514, 1471, 1439, 1420, 1390, 1320 (C–C_{arom}), 1297, 1282, 1252, 1227, 1195, 1161, 1116, 1108, 1094, 1076, 1025, 1014 (C–O), 1532, 1350 (NO_2), 870, 859, 810, 792, 774, 730, 713, 702, 655, 640, 620 (δC–H_{arom}). UV spectrum, λ_{max}, nm (ε): 210 (30000), 224 (50000), 258 (18000), 292 (5000), 310 (5000), 350 (4000). ^{1}H NMR spectrum, δ, ppm: 3.97 s (CH_3O), 7.00–9.10 m (C_6H_3, C_6H_4, $C_{10}H_7$), 8.54 s (N=CH). Found, %: C 70.71; H 4.42; N 6.30. *M* 408.3. $C_{25}H_{18}N_2O_5$. Calculated, %: C 70.42; H 4.25; N 6.57. *M* 426.4.

2-Methoxy-4-(1-naphthyliminomethyl)phenyl 4-nitrobenzoate (IIIw). Yield 95%, mp 204–205°C. IR spectrum, ν, cm^{-1}: 3117, 3090, 3075, 3058, 3043, 3008 (=C–H, C–H_{arom}), 2972, 2953, 2920, 2900, 2949 (C–H_{aliph}), 1739 (C=O), 1625 (C=N), 1599, 1588, 1569, 1515, 1469, 1456, 1421, 1397, 1365, 1323 (C–C_{arom}), 1309, 1280, 1256, 1229, 1193, 1155, 1150, 1147, 1124, 1067, 1029, 1014, 979 (C–O), 1515, 1344 (NO_2), 875, 852, 820, 810, 799, 775, 764, 720, 713, 650, 620 (δC–H_{arom}). UV spectrum, λ_{max}, nm (ε): 212 (30000), 222 (48000), 260 (20000), 290 (5000), 308 (5000), 350 (4000). ^{1}H NMR spectrum, δ, ppm: 3.99 s (CH_3O), 6.75–8.50 m (C_6H_3, C_6H_4, $C_{10}H_7$), 8.60 s (N=CH). Found, %: C 70.65; H 4.37; N 6.39. *M* 410.8. $C_{25}H_{18}N_2O_5$. Calculated, %: C 70.42; H 4.25; N 6.57. *M* 426.4.

2-Ethoxy-4-(1-naphthyliminomethyl)phenol (IVa). Yield 90%, mp 138–139°C. IR spectrum, ν, cm^{-1}: 3443 (OH), 3053, 3004 (=C–H, C–H_{arom}), 2980, 2935, 2900, 2884 (C–H_{aliph}), 1625 (C=N), 1597, 1570, 1512, 1440, 1401, 1381, 1350 (C–C_{arom}), 1477 (CH_2), 1284, 1263, 1245, 1225, 1198, 1177, 1163, 1149, 1121, 1078, 1040, 1015, 974 (C–O), 877, 820, 798, 774, 743, 653 (δC–H_{arom}). UV spectrum, λ_{max}, nm (ε): 209 (27000), 230 (26000), 260 (9000), 290 (7000), 310 (6000), 350 (5000). ^{1}H NMR spectrum, δ, ppm (*J*, Hz): 1.51 t (CH_3, ^3J = 6.9), 4.28 q (OCH_2, ^3J = 6.9), 6.70 br.s (OH), 6.80–8.40 m (C_6H_3, $C_{10}H_7$), 8.49 s (N=CH). Found, %: C 78.53; H 6.04; N 4.62. *M* 275.9. $C_{19}H_{17}NO_2$. Calculated, %: C 78.33; H 5.88; N 4.81. *M* 291.3.

2-Ethoxy-4-(1-naphthyliminomethyl)phenyl acetate (IVb). Yield 90%, mp 120–121°C. IR spectrum, ν, cm^{-1}: 3079, 3047, 3020 (=C–H, C–H_{arom}),

2984, 2960, 2950, 2926, 2900, 2884, 2850 (C–H_{aliph}), 1764 (C=O), 1622 (C=N), 1600, 1585, 1568, 1509, 1423, 1394, 1364, 1338 (C–C_{arom}), 1475 (CH_2), 1312, 1293, 1261, 1201, 1174, 1163, 1115, 1102, 1088, 1041, 1013, 974 (C–O), 884, 867, 836, 819, 796, 775, 729, 664, 650, 621 (δC–H_{arom}). UV spectrum, λ_{max}, nm (ε): 210 (28000), 230 (25000), 260 (9000), 290 (6000), 310 (6000), 350 (5000). ^{1}H NMR spectrum, δ, ppm (*J*, Hz): 1.48 t (CH_3, ^3J = 6.7), 2.38 s (CH_3CO), 4.23 q (CH_2, ^3J = 6.7), 6.95–8.40 m (C_6H_3, $C_{10}H_7$), 8.49 s (N=CH). Found, %: C 75.89; H 5.75; N 4.03. *M* 321.0. $C_{21}H_{19}NO_3$. Calculated, %: C 75.66; H 5.74; N 4.20. *M* 333.4.

2-Ethoxy-4-(1-naphthyliminomethyl)phenyl butanoate (IVc). Yield 94%, mp 36–37°C. IR spectrum, ν, cm^{-1}: 3056 (=C–H, C–H_{arom}), 2975, 2934, 2901, 2875 (C–H_{aliph}), 1762 (C=O), 1627 (C=N), 1599, 1588, 1571, 1507, 1458, 1430, 1394, 1362, 1343 (C–C_{arom}), 1477 (CH_2), 1311, 1276, 1263, 1245, 1227, 1173, 1145, 1120, 1094, 1078, 1041, 1015, 974 (C–O), 880, 870, 831, 811, 793, 774, 655, 620 (δC–H_{arom}). UV spectrum, λ_{max}, nm (ε): 209 (27000), 228 (27000), 260 (9000), 290 (5000), 310 (5000), 345 (5000). ^{1}H NMR spectrum, δ, ppm (*J*, Hz): 1.06 t (CH_3, ^3J = 5.2), 1.48 t (CH_3, ^3J = 6.7), 1.68 m (CH_2), 2.55 t (CH_2, ^3J = 5.2), 4.24 q (OCH_2, ^3J = 6.7), 6.95–8.35 m (C_6H_3, $C_{10}H_7$), 8.49 s (N=CH). Found, %: C 76.80; H 6.52; N 3.63. *M* 347.2. $C_{23}H_{23}NO_3$. Calculated, %: C 76.43; H 6.41; N 3.88. *M* 361.4.

2-Ethoxy-4-(1-naphthyliminomethyl)phenyl 2-methylpropanoate (IVd). Yield 90%, mp 61–62°C. IR spectrum, ν, cm^{-1}: 3056 (=C–H, C–H_{arom}), 2979, 2936, 2900, 2876 (C–H_{aliph}), 1761 (C=O), 1627 (C=N), 1599, 1588, 1571, 1506, 1430, 1393, 1360, (C–C_{arom}), 1469 (CH_2), 1313, 1290, 1280, 1263, 1228, 1200, 1173, 1160, 1121, 1093, 1041, 1015, 973 (C–O), 865, 793, 773, 740, 655, 620 (δC–H_{arom}). UV spectrum, λ_{max}, nm (ε): 209 (26000), 228 (27000), 260 (9000), 290 (5000), 310 (5000), 347 (5000). ^{1}H NMR spectrum, δ, ppm (*J*, Hz): 1.36 d [$(CH_3)_2C$, ^3J = 7.4), 1.47 t (CH_3, ^3J = 6.7), 2.90 quint (CH, ^3J = 7.4), 4.24 q (CH_2, ^3J = 6.7), 6.94–8.37 m (C_6H_3, $C_{10}H_7$), 8.50 s (=CH). Found, %: C 76.79; H 6.57; N 3.55. *M* 342.7. $C_{23}H_{23}NO_3$. Calculated, %: C 76.43; H 6.41; N 3.88. *M* 361.4.

Bis[2-ethoxy-4-(1-naphthyliminomethyl)phenyl] butane-1,4-dioate (IVe). Yield 94%, mp 157–158°C. IR spectrum, ν, cm^{-1}: 3090, 3060, 3050, 3005 (=C–H, C–H_{arom}), 2990, 2980, 2920, 2900, 2880 (C–H_{aliph}), 1762 (C=O), 1628 (C=N), 1600, 1586, 1573, 1510, 1425, 1392, 1350 (C–C_{arom}), 1480, 1455 (CH_2), 1304, 1294, 1230, 1200, 1176, 1165, 1118, 1080, 1043, 1015, 985 (C–O), 860, 840, 815, 792, 772, 720, 670, 655, 620 (δC–H_{arom}). UV spectrum, λ_{max}, nm (ε): 209 (51000), 230 (50000), 260 (18000), 286 (9000), 310 (10000), 345 (9000). ^{1}H NMR spectrum, δ, ppm, (*J*, Hz): 1.47 t (CH_3, ^3J = 6.7), 3.13 s (CH_2CH_2), 4.24 q (OCH_2, ^3J = 6.7), 6.90–8.40 m (C_6H_3, $C_{10}H_7$), 8.50 s (N=CH). Found, %: C 76.13; H 5.51; N 4.06. *M* 643.1. $C_{42}H_{36}N_2O_6$. Calculated, %: C 75.89; H 5.46; N 4.21. *M* 664.8.

2-Ethoxy-4-(1-naphthyliminomethyl)phenyl benzoate (IVf). Yield 91%, mp 78–79°C. IR spectrum, ν, cm^{-1}: 3085, 3060, 3040, 3005 (=C–H, C–H_{arom}), 2990, 2980, 2960, 2920, 2880, 2835 (C–H_{aliph}), 1731 (C=O), 1627 (C=N), 1597, 1572, 1508, 1480, 1450, 1431, 1391, 1380, 1340 (C–C_{arom}), 1315, 1282, 1263, 1227, 1200, 1173, 1163, 1148, 1121, 1080, 1060, 1045, 1024, 981 (C–O), 870, 865, 807, 798, 780, 764, 697, 681, 670, 617 (δC–H_{arom}). UV spectrum, λ_{max}, nm (ε): 207 (41000), 223 (40000), 260 (21000), 290 (9000), 310 (7000), 345 (5000). ^{1}H NMR spectrum, δ, ppm (*J*, Hz): 1.36 t (CH_3, ^3J = 6.7), 4.23 q (CH_2, ^3J = 6.7), 6.94–8.35 m (C_6H_3, C_6H_5, $C_{10}H_7$), 8.52 s (N=CH). Found, %: C 79.16; H 5.41; N 3.28. *M* 376.3. $C_{26}H_{21}NO_3$. Calculated, %: C 78.94; H 5.35; N 3.54. *M* 395.5.

2-Ethoxy-4-(1-naphthyliminomethyl)phenyl 4-methylbenzoate (IVg). Yield 93%, mp 112–113°C. IR spectrum, ν, cm^{-1}: 3100, 3075, 3060, 3045, 3005 (=C–H, C–H_{arom}), 2980, 2960, 2920, 2880, 2850, 2830 (C–H_{aliph}), 1727 (C=O), 1630 (C=N), 1615, 1602, 1585, 1570, 1520, 1510, 1480, 1420, 1390 (C–C_{arom}), 1465 (CH_2), 1316, 1295, 1268, 1220, 1200, 1173, 1165, 1115, 1074, 1044, 1015, 980 (C–O), 880, 870, 840, 820, 810, 795, 772, 746, 690 (δC–H_{arom}). UV spectrum, λ_{max}, nm (ε): 209 (42000), 227 (34000), 257 (25000), 290 (7000), 310 (6000), 350 (4000). ^{1}H NMR spectrum, δ, ppm (*J*, Hz): 1.35 t (CH_3, ^3J = 6.6), 2.51 s (CH_3), 4.22 q (CH_2, ^3J = 6.6), 6.70–8.40 m (C_6H_3, C_6H_4, $C_{10}H_7$), 8.52 s (N=CH). Found, %: C 79.48; H 5.82; N 3.16. *M* 394.3. $C_{27}H_{23}NO_3$. Calculated, %: C 79.20; H 5.66; N 3.42. *M* 409.5.

2-Ethoxy-4-(1-naphthyliminomethyl)phenyl 2-chlorobenzoate (IVh). Yield 94%, mp 77–78°C. IR spectrum, ν, cm^{-1}: 3085, 3060, 3045, 3005 (=C–H, C–H_{arom}), 2980, 2955, 2920, 2900, 2875, 2850 (C–H_{aliph}), 1756 (C=O), 1624 (C=N), 1600, 1587, 1571, 1508, 1474, 1434, 1420, 1392, 1350 (C–C_{arom}),

1468 (CH_2), 1315, 1293, 1263, 1242, 1228, 1195, 1164, 1115, 1096, 1039, 1015, 980 (C–O), 880, 860, 820, 794, 768, 746, 735, 705, 650 (δC–H_{arom}), 560 (C–Cl). UV spectrum, λ_{max}, nm (ε): 208 (34000), 220 (30000), 228 (30000), 258 (14000), 290 (6000), 310 (6000), 350 (4000). ^{1}H NMR spectrum, δ, ppm (*J*, Hz): 1.36 t (CH_3, ^3J = 6.7), 4.24 q (CH_2, ^3J = 6.7), 6.75–8.48 m (C_6H_3, C_6H_4, $C_{10}H_7$), 8.53 s (=CH). Found, %: C 72.93; H 4.88; Cl 7.97; N 2.90. *M* 399.6. $C_{26}H_{20}ClNO_3$. Calculated, %: C 72.64; H 4.69; Cl 8.25; N 3.26. *M* 429.9.

2-Ethoxy-4-(1-naphthyliminomethyl)phenyl 4-chlorobenzoate (IVi). Yield 92%, mp 131–132°C. IR spectrum, ν, cm^{-1}: 3100, 3080, 3060, 3050, 3040, (=C–H, C–H_{arom}), 2985, 2970, 2940, 2900, 2880, 2870, 2845, (C–H_{aliph}), 1729 (C=O), 1630 (C=N), 1601, 1589, 1560, 1512, 1480, 1445, 1420, 1400, 1395, 1350, 1340 (C–C_{arom}), 1462 (CH_2), 1315, 1296, 1263, 1200, 1170, 1116, 1105, 1092, 1072, 1045, 1014, 978 (C–O), 880, 870, 847, 830, 825, 795, 774, 752, 680, 650, 620 (δC–H_{arom}), 520 (C–Cl). UV spectrum, λ_{max}, nm (ε): 208 (41000), 220 (30000), 227 (29000), 255 (15000), 290 (6000), 308 (6000), 350 (4000). ^{1}H NMR spectrum, δ, ppm (*J*, Hz): 1.36 t (CH_3, ^3J = 6.7), 4.22 q (CH_2, ^3J = 6.7), 6.95–8.40 m (C_6H_3, C_6H_4, $C_{10}H_7$), 8.52 s (N=CH). Found, %: C 72.82; H 4.73; Cl 8.00; N 3.20. *M* 407.8. $C_{26}H_{20}ClNO_3$. Calculated, %: C 72.64; H 4.69; Cl 8.25; N 3.26. *M* 429.9.

This study was performed under financial support by the Byelorussian Republican Foundation for Basic Research (project no. Kh 03–079).

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