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Reaction of Anthranilic Acid Amides with Cyclic Anhydrides

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Abstract—Anthranilic acid amide reacts with cyclic anhydrides to give the corresponding *N*-acyl derivatives at the amino group, while analogous reactions of *o*-aminobenzohydroxamic acid lead to formation of 3-hydroxyquinazolin-4-ones under mild conditions. *N*-Acyl derivatives of anthranilic acid amide undergo intramolecular cyclization to imides on microwave irradiation or on melting, and their treatment with acetic anhydride in the presence of sodium acetate on heating yields quinazolin-4-ones.

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Many compounds of the quinazoline series exhibit a broad spectrum of biological activity. Among these, both naturally occurring substances such as alkaloids and antibiotics [1, 2] and synthetic products possessing antiphlogistic [3], antimicrobial [4], and antiallergic [5] activity, as well as α-adrenomimetics (Prazozine, Deoxypeganine hydrochloride, etc.) [6] have been reported.

Quinazolin-4-ones are mainly synthesized from anthranilic acid and its functional derivatives, in particular N-substituted anthranilic acid amides [7, 8]. We previously showed that acylation of anthranilic acid hydrazide with dicarboxylic acid anhydrides, followed by cyclodehydration, gives rise to products containing a quinazolinone or cyclic imide fragment, depending on the reaction conditions [9]. In continuation of these studies, in the present work we examined reactions of anthranilic acid amides **I** and **II** with cyclic anhydrides.

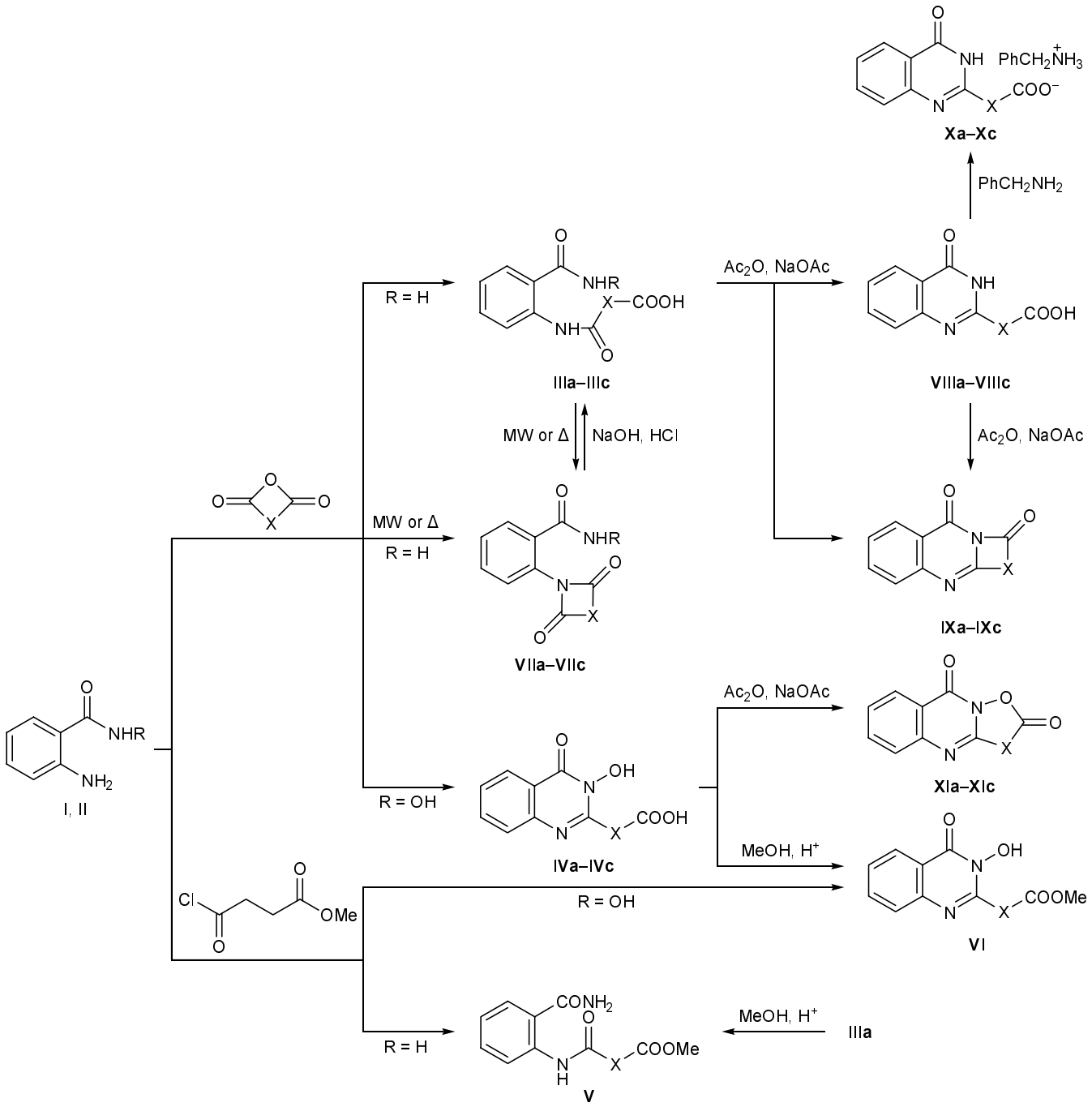
Initial *o*-aminobenzohydroxamic acid (**II**) was synthesized according to a modified procedure [10]. The early procedure included dissolution of crystalline *o*-aminobenzohydroxamic acid sodium salt in water, followed by acidification. Insofar as hydroxamic acids readily undergo hydrolysis in alkaline medium, while the hydrolysis in acid medium is more difficult [11], anthranilic acid was also formed together with the major product, acid **II**. Both acids are characterized by similar melting points (the difference is as small as 1–2°C), which complicates the isolation process. In order to avoid hydrolysis, we proposed to isolate acid **II** by adding dilute acetic acid to the sodium salt of **II**.

Our studies revealed that compounds **I** and **II** reacted differently with cyclic anhydrides: the reaction either stopped at the stage of formation of the corresponding *N*-acyl derivative or was followed by cyclodehydration to produce quinazoline ring system (Scheme 1). By acylation of anthranilic acid amide (**I**) we obtained only *N*-acyl derivatives **IIIa**–**IIIc**. *N*-Hydroxy amide **II** reacted with the same anhydrides in acetic acid to afford 3-hydroxyquinazolin-4-one derivatives **IVa**–**IVc** which displayed no NH signal in the ^{1}H NMR spectra. We failed to isolate the corresponding acylation products by varying the reaction conditions, namely by lowering the temperature or using dioxane or DMF as solvent instead of acetic acid.

The observed difference in the reaction paths of amides **I** and **II** with cyclic anhydrides may be rationalized on the basis of different nucleophilicities of the amide and *N*-hydroxy amide groups. It is known that hydroxamic acids exhibit enhanced nucleophilicity due to α-effect [12]. Replacement of cyclic anhydrides by acid chlorides did not change the reaction pattern. Amide **I** reacted with methyl 4-chloro-4-oxobutanoate to give ester **V**, while the reaction of *N*-hydroxy amide **II** with the same compound afforded quinazolin-4-one derivative **VI**. The ^{1}H NMR spectrum of the latter contained a signal from the CH_3 group. Both esters **V** and **VI** were synthesized independently by esterification of acids **IIIa** [8] and **IVa**, respectively.

Attempts to convert acids **IIIa**–**IIIc** into cyclic derivatives, i.e., the corresponding imides or quinazolin-4-ones, by heating in acetic acid were unsuccessful: only the initial compounds were isolated from the reaction mixtures even after heating for 6 h under

Scheme 1.



I, R = H; **II**, R = OH; **IIIa**, **IVa**, **V**, **VI**, **VIIa**–**XIa**, X = $(CH_2)_2$; **III**, **IV**, **VII**–**XI**, X = CH=CH (**b**), *o*-C_6H_4 (**c**)

reflux. According to published data [13], some acids having an amide group give rise to the corresponding N-substituted imides under analogous conditions. In our case, the lack of cyclization to imides may be attributed to the presence of a bulky substituent in the *ortho* position. Lower nucleophilicity of the amide group as compared to hydrazide (*N*-acyl derivatives of anthranilic acid hydrazide are known to be converted into quinazolinones under similar conditions [14]) may be a factor making formation of quinazoline ring impossible.

Under more severe conditions, i.e., on heating acids **IIIa**–**IIIc** to the melting point or subjecting them to microwave irradiation (MW), the effect of the *ortho*

substituent was overcome, and closure of imide ring occurred to produce compounds **VIIa**–**VIIc**. Alternatively, imides **VIIa**–**VIIc** were obtained by fusion of a mixture of amide **I** and the corresponding cyclic anhydride or by microwave-activated reaction of these compounds. Unlike acids **IIIa**–**IIIc**, in the ^{1}H NMR spectra of compounds **VIIa**–**VIIc** we observed no COOH proton signal, and signals from protons of the $CONH_2$ group appeared as a broadened singlet. Imides **VIIa**–**VIIc** readily undergo hydrolysis to acids **IIIa**–**IIIc** in alkaline medium.

By heating acids **IIIa**–**IIIc** for a short time (10–15 min) in acetic anhydride in the presence of sodium acetate we obtained quinazolin-4-ones **VIIIa**–**VIIIc**. When the reaction time was prolonged to 60 min, we isolated lactams **IXa**–**IXc**. The latter were also synthesized by heating quinazolin-4-ones **VIIIa**–**VIIIc** in boiling acetic anhydride in the presence of sodium acetate. Acids **VIIIa**–**VIIIc** reacted with benzylamine to form salts **Xa**–**Xc**; aqueous solutions of these salts are characterized by alkaline reaction. Treatment of quinazolin-4-ones **IVa**–**IVc** with acetic anhydride in the presence of sodium acetate gave lactones **XIa**–**XIc**.

EXPERIMENTAL

The ^{1}H NMR spectra were recorded from solutions in DMSO-d_6 on a Varian M200 spectrometer operating at 200 MHz; tetramethylsilane was used as internal reference. Microwave-activated reactions were performed in a microwave furnace at a power of 800 W. The elemental compositions were determined on a Carlo Erba CHNS-O EA 1108 analyzer.

4-(2-Carbamoylphenylamino)-4-oxobutanoic acid (IIIa). Amide **I**, 0.01 mol (1.00 g), was dissolved in 3 ml of glacial acetic acid, and a solution of 0.01 mol of succinic anhydride in 3 ml of acetic acid was added. After 30 min, the mixture was diluted with cold water. Yield 91%, mp 222–224°C (from acetic acid). ^{1}H NMR spectrum, δ, ppm: 2.61 m (4H, CH_2CH_2), 7.08 t (1H, *o*-C_6H_4), 7.46 t (1H, *o*-C_6H_4), 7.72 s (1H, NH_2), 7.74 d (1H, *o*-C_6H_4), 8.24 s (1H, NH_2), 8.42 d (1H, *o*-C_6H_4), 11.71 s (1H, NHCO), 12.09 br.s (1H, OH). Found, %: C 56.01; H 5.27; N 11.80. $C_{11}H_{12}N_2O_4$. Calculated, %: C 55.93; H 5.12; N 11.86.

Acids **IIIb** and **IIIc** were synthesized in a similar way.

4-(2-Carbamoylphenylamino)-4-oxobut-2-enoic acid. Yield 83%, mp 187–189°C (from acetic acid). ^{1}H NMR spectrum, δ, ppm: 6.25 d (1H, CH=CH), 6.51 d (1H, CH=CH), 7.46 t (1H, *o*-C_6H_4), 7.58 d (1H, *o*-C_6H_4), 7.74 t (1H, *o*-C_6H_4), 8.08 d (1H, *o*-C_6H_4), 11.91 br.s (1H, NH). Found, %: C 56.98; H 4.69; N 11.88. $C_{11}H_{10}N_2O_4$. Calculated, %: C 56.41; H 4.30; N 11.96.

2-(2-Carbamoylphenylcarbamoyl)benzoic acid (IIIc). Yield 2.50 g (88%), mp 251–253°C (from acetic acid). ^{1}H NMR spectrum, δ, ppm: 7.15 t (1H, *o*-C_6H_4), 7.65 m (4H, *o*-COC_6H_4CO), 7.71 t (1H, *o*-C_6H_4), 7.75 s (1H, NH_2), 7.93 d (1H, *o*-C_6H_4), 8.29 s (1H, NH_2), 8.55 d (1H, *o*-C_6H_4), 12.20 s (1H, NHCO), 13.02 br.s (1H, OH). Found, %: C 63.01; H 4.18; N 9.91. $C_{15}H_{12}N_2O_4$. Calculated, %: C 63.38; H 4.25; N 9.85.

3-(3-Hydroxy-4-oxo-3,4-dihydroquinazolin-2-yl)-propionic acid (IVa). A solution of 0.01 mol of succinic anhydride in 3 ml of acetic acid was added under stirring and cooling to a solution of 0.01 mol of amide **II** in 3 ml of acetic acid. After 30 min, the mixture was diluted with cold water. Yield 89%, mp 203–205°C (from dioxane). ^{1}H NMR spectrum, δ, ppm: 2.72 m (2H, CH_2CH_2), 3.09 m (2H, CH_2CH_2), 7.46 t (1H, *o*-C_6H_4), 7.62 d (1H, *o*-C_6H_4), 7.76 t (1H, *o*-C_6H_4), 8.12 d (1H, *o*-C_6H_4), 11.95 br.s (2H, OH). Found, %: C 55.91; H 4.12; N 11.87. $C_{11}H_{10}N_2O_4$. Calculated, %: C 56.41; H 4.30; N 11.96.

Compounds **IVb** and **IVc** were synthesized in a similar way.

3-(3-Hydroxy-4-oxo-3,4-dihydroquinazolin-2-yl)-acrylic acid (IVb). Yield 73%, mp 232–234°C (from dioxane). ^{1}H NMR spectrum, δ, ppm: 7.05 d (1H, CH=CH), 7.45 d (1H, CH=CH), 7.85 m (3H, *o*-C_6H_4), 8.25 s (1H, *o*-C_6H_4), 12.25 br.s (2H, OH). Found, %: C 56.77; H 3.51; N 12.13. $C_{11}H_8N_2O_4$. Calculated, %: C 56.90; H 3.47; N 12.06.

2-(3-Hydroxy-4-oxo-3,4-dihydroquinazolin-2-yl)-benzoic acid (IVc). Yield 84%, mp 285–287°C (from dioxane). ^{1}H NMR spectrum, δ, ppm: 7.62 t (1H, *o*-C_6H_4), 7.88 m (2H, *o*-COC_6H_4CO), 7.94 d (1H, *o*-C_6H_4), 8.16 t (1H, *o*-C_6H_4), 8.26 m (2H, *o*-COC_6H_4-CO), 8.64 d (1H, *o*-C_6H_4). Found, %: C 64.03; H 3.49; N 10.01. $C_{15}H_{10}N_2O_4$. Calculated, %: C 63.83; H 3.57; N 9.92.

Methyl 4-(2-carbamoylphenylamino)-4-oxobutanoate (V). *a.* Amide **I**, 0.01 mol, was dissolved in 3 ml of acetic acid, and 0.01 mol of triethylamine and 0.01 mol of methyl 4-chloro-4-oxobutanoate were added on cooling. After 30 min, the mixture was diluted

with cold water. Yield 82%, mp 128–131°C (from methanol).

b. Acid **IIIa**, 0.01 mol, was heated for 30 min in methanol containing one drop of sulfuric acid. The mixture was cooled and diluted with cold water. Yield 86%, mp 130–132°C (from methanol). ^{1}H NMR spectrum, δ, ppm: 2.62 m (4H, CH_2CH_2), 3.60 s (3H, CH_3), 7.08 t (1H, *o*-C_6H_4), 7.48 t (1H, *o*-C_6H_4), 7.72 s (1H, NH_2), 7.76 d (1H, *o*-C_6H_4), 8.24 s (1H, NH_2), 8.40 d (1H, *o*-C_6H_4), 11.69 s (1H, NHCO). Found, %: C 56.90; H 5.80; N 11.14. $C_{12}H_{14}N_2O_4$. Calculated, %: C 57.59; H 5.64; N 11.19. The products obtained by the two methods (*a* and *b*) were identical, and their properties were consistent with the data given in [8].

Methyl 3-(3-hydroxy-4-oxo-3,4-dihydroquinazolin-2-yl)propionate (VI). *a*. Amide **II**, 0.01 mol, was dissolved in 3 ml of acetic acid, and 0.01 mol of triethylamine and 0.01 mol of methyl 4-chloro-4-oxobutanoate were added on cooling. After 30 min, the mixture was diluted with cold water. Yield 78%, mp 183–185°C (from methanol).

b. Acid **IVa**, 0.01 mol, was heated for 30 min in methanol containing one drop of sulfuric acid. The mixture was cooled and diluted with cold water. Yield 86%, mp 184–186°C (from methanol). ^{1}H NMR spectrum, δ, ppm: 2.85 m (2H, CH_2CH_2), 3.15 m (2H, CH_2CH_2), 3.65 s (3H, CH_3), 7.51 t (1H, *o*-C_6H_4), 7.62 d (1H, *o*-C_6H_4), 7.80 t (1H, *o*-C_6H_4), 8.10 d (1H, *o*-C_6H_4), 11.80 br.s (1H, OH). Found, %: C 57.56; H 4.92; N 11.35. $C_{12}H_{12}N_2O_4$. Calculated, %: C 58.06; H 4.87; N 11.28.

***N*-(2-Carbamoylphenyl)succinimide (VIIa).** *a*. Acid **IIIa**, 0.01 mol, was heated until it melted and for 10 s more. The melt was cooled and washed with dioxane with simultaneous crystallization. Yield 97%, mp >290°C (from dioxane).

b. Acid **IIIa**, 0.01 mol, was subjected to microwave irradiation over a period of 30 s; the product was isolated as described above in *a*. Yield 98%, mp >290°C (from dioxane).

c. A mixture of 0.01 mol of amide **I** and 0.01 mol of succinic anhydride was heated until it melted and for 10 s more; the product was isolated as described above in *a*. Yield 92%, mp >290°C (from dioxane).

d. A mixture of 0.01 mol of amide **I** and 0.01 mol of succinic anhydride was subjected to microwave irradiation over a period of 20 s; the product was isolated as described above in *a*. Yield 98%, mp >290°C (from dioxane). ^{1}H NMR spectrum, δ, ppm: 3.75 m (2H, CH_2CH_2), 3.85 m (2H, CH_2CH_2), 6.85 br.s (2H, NH_2), 7.50 m (2H, *o*-C_6H_4), 7.65t (1H, *o*-C_6H_4), 8.10 d (1H, *o*-C_6H_4). Found, %: C 60.09; H 4.55; N 12.76. $C_{11}H_{10}N_2O_3$. Calculated, %: C 60.55; H 4.62; N 12.84.

Compounds **VIIb** and **VIIc** were synthesized in a similar way.

***N*-(2-Carbamoylphenyl)maleimide (VIIb).** Yield 93%, mp 210–215°C (from dioxane). ^{1}H NMR spectrum, δ, ppm: 6.82 br.s (2H, NH_2), 7.08 d (1H, CH=CH), 7.52 d (1H, CH=CH), 7.96 m (3H, *o*-C_6H_4), 8.32 d (1H, *o*-C_6H_4). Found, %: C 61.47; H 3.79; N 13.02. $C_{11}H_8N_2O_3$. Calculated, %: C 61.11; H 3.73; N 12.96.

***N*-(2-Carbamoylphenyl)phthalimide (VIIc).** Yield 56%, mp 272–274°C (from dioxane). ^{1}H NMR spectrum, δ, ppm: 6.70 br.s (2H, NH_2), 7.25 m (2H, *o*-C_6H_4), 7.55 m (4H, *o*-COC_6H_4CO), 7.80 t (1H, *o*-C_6H_4), 8.12 d (1H, *o*-C_6H_4). Found, %: C 67.18; H 3.84; N 10.47. $C_{15}H_{10}N_2O_3$. Calculated, %: C 67.67; H 3.79; N 10.52.

3-(4-Oxo-3,4-dihydroquinazolin-2-yl)propionic acid (VIIIa). A mixture of 0.01 mol of acid **IIIa**, 3 ml of acetic anhydride, and 0.01 mol of sodium acetate was heated for 15 min. The mixture was cooled and diluted with cold water. Yield 78%, mp 255–257°C (from dioxane). ^{1}H NMR spectrum, δ, ppm: 2.59 m (2H, CH_2CH_2), 2.9 m (2H, CH_2CH_2), 7.44 t (1H, *o*-C_6H_4), 7.56 t (1H, *o*-C_6H_4), 7.76 t (1H, *o*-C_6H_4), 8.06 d (1H, *o*-C_6H_4), 12.19 br.s (1H, NH). Found, %: C 61.00; H 4.71; N 12.99. $C_{11}H_{10}N_2O_3$. Calculated, %: C 60.55; H 4.62; N 12.84.

Compounds **VIIIb** and **VIIIc** were synthesized in a similar way.

3-(4-Oxo-3,4-dihydroquinazolin-2-yl)acrylic acid (VIIIb). Yield 65%, mp 270–272°C (from dioxane). ^{1}H NMR spectrum, δ, ppm: 6.86 d (1H, CH=CH), 7.18 d (1H, CH=CH), 7.06 t (1H, *o*-C_6H_4), 7.41 s (1H, $CONH_2$), 7.50 t (1H, *o*-C_6H_4), 7.56 d (1H, *o*-C_6H_4), 8.25 s (1H, $CONH_2$), 8.48 d (1H, *o*-C_6H_4). Found, %: C 60.09; H 5.61; N 12.80. $C_{11}H_8N_2O_3$. Calculated, %: C 61.11; H 3.73; N 12.96.

2-(4-Oxo-3,4-dihydroquinazolin-2-yl)benzoic acid (VIIIc). Yield 79%, mp >290°C (from dioxane). ^{1}H NMR spectrum, δ, ppm: 7.58 t (1H, *o*-C_6H_4), 7.76 m (2H, *o*-COC_6H_4CO), 7.82 d (1H, *o*-C_6H_4), 8.09 t (1H, *o*-C_6H_4), 8.18 m (2H, *o*-COC_6H_4CO), 8.56 d (1H, *o*-C_6H_4), 12.10 br.s (1H, NH). Found, %: C 67.12; H 3.68; N 10.59. $C_{15}H_{10}N_2O_3$. Calculated, %: C 67.67; H 3.79; N 10.52.

2,3-Dihydropyrrolo[2,1-*b*]quinazoline-1,9-dione (IXa). *a*. A mixture of 0.01 mol of acid **IIIa**, 3 ml of acetic anhydride, and 0.01 mol of sodium acetate was heated for 60 min. The mixture was cooled and diluted with cold water. Yield 72%, mp 152–154°C (from dioxane).

b. A mixture of 0.01 mol of compound **IVa**, 3 ml of acetic anhydride, and 0.01 mol of sodium acetate was heated for 30 min. The mixture was cooled and diluted with cold water. Yield 71%, mp 151–153°C (from dioxane). ^{1}H NMR spectrum, δ, ppm: 2.92 s (4H, CH_2CH_2), 7.51 d (1H, *o*-C_6H_4), 7.65 t (1H, *o*-C_6H_4), 7.87 t (1H, *o*-C_6H_4), 8.05 d (1H, *o*-C_6H_4). Found, %: C 66.42; H 3.95; N 13.92. $C_{11}H_8N_2O_2$. Calculated, %: C 66.00; H 4.03; N 13.99. The products obtained by the two methods (*a* and *b*) were identical to that synthesized by reaction of 5-ethoxypyrrolidin-2-one with methyl *o*-aminobenzoate [14].

Compounds **IXb** and **IXc** were synthesized in a similar way.

Pyrrolo[2,1-*b*]quinazoline-1,9-dione (IXb). Yield 58%, mp 144–146°C (from dioxane). ^{1}H NMR spectrum, δ, ppm: 6.82 d (1H, CH=CH), 7.06 d (1H, CH=CH), 7.50 d (1H, *o*-C_6H_4), 7.62 t (1H, *o*-C_6H_4), 7.86 t (1H, *o*-C_6H_4), 8.00 d (1H, *o*-C_6H_4). Found, %: C 66.58; H 3.18; N 14.10. $C_{11}H_6N_2O_2$. Calculated, %: C 66.67; H 3.05; N 14.14.

Isoindolo[1,2-*b*]quinazoline-10,12-dione (IXc). Yield 64%, mp 217–219°C (from dioxane). ^{1}H NMR spectrum, δ, ppm: 7.66 t (1H, *o*-C_6H_4), 7.84 m (2H, *o*-COC_6H_4CO), 7.96 d (1H, *o*-C_6H_4), 8.18 t (1H, *o*-C_6H_4), 8.24 m (2H, *o*-COC_6H_4CO), 8.65 d (1H, *o*-C_6H_4). Found, %: C 72.09; H 3.32; N 11.33. $C_{15}H_8N_2O_2$. Calculated, %: C 72.58; H 3.25; N 11.28.

Benzylammonium 3-(4-oxo-3,4-dihydroquinazolin-2-yl)propionate (Xa). Acid **VIIIa**, 0.01 mol, was dissolved in 5 ml of ethanol or dioxane, and 0.01 mol of benzylamine was added. After 30 min, the precipitate was filtered off and dried. Yield 77%, mp 250–252°C. ^{1}H NMR spectrum, δ, ppm: 2.55 m (2H, CH_2CH_2), 2.80 t (2H, CH_2CH_2), 3.91 s (2H, C**H**$_2$Ph), 5.6 br.s (3H, H_3N^+), 7.30 m (5H, C_6H_5), 7.41 t (1H, *o*-C_6H_4), 7.55 d (1H, *o*-C_6H_4), 7.75 t (1H, *o*-C_6H_4), 8.11 d (1H, *o*-C_6H_4). Found, %: C 64.12; H 6.38; N 12.69. $C_{18}H_{19}N_3O_3$. Calculated, %: C 66.45; H 5.89; N 12.91.

Salts **Xb** and **Xc** were synthesized in a similar way.

Benzylammonium 3-(4-oxo-3,4-dihydroquinazolin-2-yl)acrylate (Xb). Yield 65%, mp 270–272°C. ^{1}H NMR spectrum, δ, ppm: 3.85 br.s (2H, C**H**$_2$Ph), 5.48 br.s (3H, H_3N^+), 6.77 d (1H, CH=CH), 6.98 d (1H, CH=CH), 7.42 m (5H, C_6H_5), 7.52 t (1H, *o*-C_6H_4), 7.70 d (1H, *o*-C_6H_4), 7.82 t (1H, *o*-C_6H_4), 8.16 d (1H, *o*-C_6H_4). Found, %: C 64.71; H 5.51; N 12.79. $C_{18}H_{17}N_3O_3$. Calculated, %: C 66.86; H 5.30; N 13.00.

Benzylammonium 2-(4-oxo-3,4-dihydroquinazolin-2-yl)benzoate (Xc). Yield 77%, mp 257–259°C. ^{1}H NMR spectrum, δ, ppm: 3.82 s (2H, C**H**$_2$Ph), 5.31 br.s (3H, H_3N^+), 7.26 m (5H, *o*-C_6H_4), 7.34 m (2H, *o*-COC_6H_4CO), 7.48 d (1H, *o*-C_6H_4), 7.86 t (1H, *o*-C_6H_4), 8.02 m (2H, *o*-COC_6H_4CO), 8.26 d (1H, *o*-C_6H_4). Found, %: C 70.43; H 5.30; N 12.98. $C_{22}H_{19}N_3O_3$. Calculated, %: C 70.76; H 5.13; N 11.25.

3,4-Dihydro[1,2]oxazino[2,3-*b*]quinazoline-2,10-dione (XIa). A mixture of 0.01 mol of acid **IVa**, 3 ml of acetic anhydride, and 0.01 mol of sodium acetate was heated for 30 min at room temperature. The precipitate was filtered off and washed with ethanol. Yield 61%, mp 186–188°C (from dioxane). ^{1}H NMR spectrum, δ, ppm: 2.81 s (4H, CH_2CH_2), 7.35 d (1H, *o*-C_6H_4), 7.55 m (2H, *o*-C_6H_4), 7.72 m (1H, *o*-C_6H_4). Found, %: C 61.31; H 3.04; N 13.04. $C_{11}H_8N_2O_3$. Calculated, %: C 61.11; H 3.73; N 12.96.

Compounds **XIb** and **XIc** were synthesized in a similar way.

[1,2]Oxazino[2,3-*b*]quinazoline-2,10-dione (XIb). Yield 62%, mp 210–212°C (from dioxane). ^{1}H NMR spectrum, δ, ppm: 6.98 d (1H, CH=CH), 7.24 d (1H, CH=CH), 7.46 d (1H, *o*-C_6H_4), 7.64 m (2H, *o*-C_6H_4), 7.80 t (1H, *o*-C_6H_4). Found, %: C 61.57; H 2.69; N 13.14. $C_{11}H_{16}N_2O_3$. Calculated, %: C 61.69; H 2.82; N 13.08.

[1,2]Benzooxazino[2,3-*b*]quinazoline-2,10-dione (XIc). Yield 51%, mp 269–271°C (from dioxane). ^{1}H NMR spectrum, δ, ppm: 7.54 t (1H, *o*-C_6H_4), 7.76 m (2H, *o*-COC_6H_4CO), 7.82 d (1H, *o*-C_6H_4), 8.02 t (1H, *o*-C_6H_4), 8.18 m (2H, *o*-COC_6H_4CO), 8.52 d (1H, *o*-C_6H_4). Found, %: C 68.52; H 2.91; N 10.51. $C_{15}H_{18}N_2O_3$. Calculated, %: C 68.18; H 3.05; N 10.60.

REFERENCES

1. Moskovkina, T.V., *Russ. J. Org. Chem*., 1997, vol. 33, p. 125.
2. Le Coeur, C., Grelard, A., Thiery, V., and Besson, T., *Tetrahedron*, 2001, vol. 42, p. 6671.
3. Daidon, G., Raffa, D., Plescia, S., and Mantione, L., *Eur. J. Med. Chem*., 2001, vol. 36, p. 737.
4. El-Meligic, S., El-Ansary, A.K., Said, M.M., and Hussein, M.M., *Indian J. Chem., Sect. B*, 2001, vol. 40, p. 62.

5. Dev, S.S., Bhagovan, R.M., Bahekar, R.H., Rajan, K.S., and Ram, R.A., *Indian J. Chem., Sect. B*, 2001, vol. 40, p. 813.
6. Mashkovskii, M.D., *Lekarstvennye sredstva* (Drugs), Moscow: Novaya Volna, 2000.
7. *Heterocyclic Compounds*, Elderfield, R.C., Ed., New York: Wiley, 1957, vol. 6. Translated under the title *Geterotsiklicheskie soedineniya*, Moscow: Inostrannaya Literatura, 1960, vol. 6, p. 268; Kundu, N.G. and Chaudhuri, G., *Tetrahedron Lett*., 2001, vol. 42, p. 2883; O'Mahoney, D.J.R. and Krchňák, V., *Tetrahedron Lett*., 2002, vol. 43, p. 939.
8. Mhaske, S.B. and Argade, N.P., *J. Org. Chem*., 2001, vol. 66, p. 9038.
9. Shemchuk, L.A., *Russ. J. Org. Chem*., 1998, vol. 34, p. 534.
10. Stolberg, V., Mosher, W., and Wagner-Jauregg, T., *J. Am. Chem. Soc*., 1957, vol. 19, p. 2615.
11. *Comprehensive Organic Chemistry*, Barton, D. and Ollis, W.D., Eds., Oxford: Pergamon, 1979, vol. 2. Translated under the title *Obshchaya organicheskaya khimiya*, Moscow: Khimiya, 1983, vol. 4, p. 505.
12. Grekov, A.P. and Veselov, V.Ya., *Fizicheskaya khimiya gidrazina* (Physical Chemistry of Hydrazine), Kiev: Naukova Dumka, 1979, p. 26.
13. Gritsenko, I.S., *Doctoral (Chem.) Dissertation*, Khar'kov, 1992; Shemchuk, L.A., Chernykh, V.P., Ivanova, I.L., Snitkovskii, E.L., Zhirov, M.V., and Turov, A.V., *Russ. J. Org. Chem*., 1999, vol. 35, p. 286.
14. Nagasaka, T., Hamaguchi, F., Ozava, N., and Ohki, S., *Heterocycles*, 1978, vol. 9, p. 1375.