Supplementary file

Sadiq Mohammed B, Shakir Turkey N (2024) Utilizing the NAG-4SX3-3D analyzer at 0-180 degree coupling with continuous flow injection analysis to determine of loratadine in drugs by the precipitation method using sodium nitroprusside. Cellular, Molecular and Biomedical Reports 4 (3): 138-149. doi: 10.55705/cmbr.2024.429561.1214

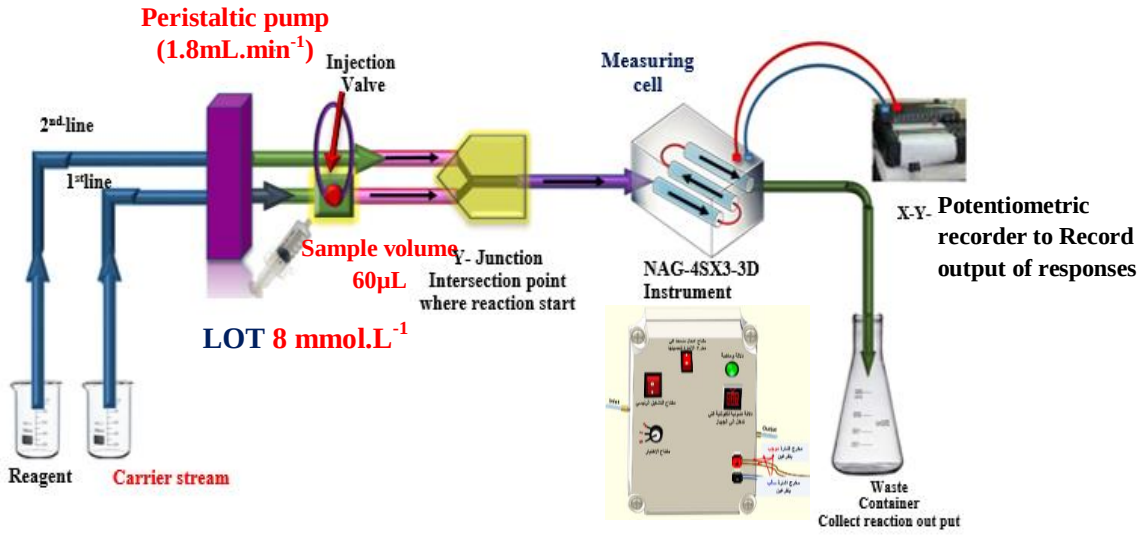

Fig. s1. A figure demonstrating the utilization of manifold in the evaluation of the NAG4SX3Analyzer

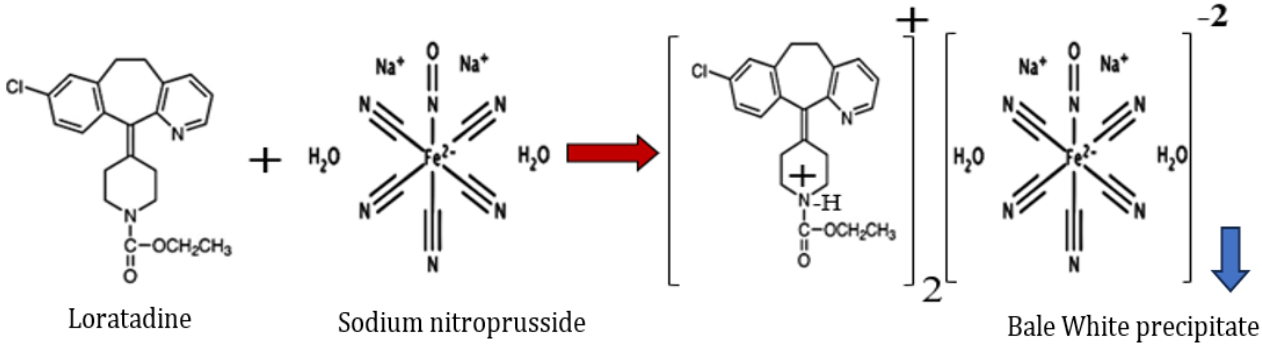

Fig. s2. Proposed reaction for LOT – SNP- system

Table 1s. The summary of statistical analysis of regression line of f reference method (UV spectrophotometry)

Type of mode	Range of [LOT] m.M(n)	$\hat{Y}_{Z\,i}=a \pm S_a\, t+b(\Delta y/\Delta x_{mmol/L})\pm S_b\, t$ [LOT] m.M at confidence level 95%, n-2	r, r^2, R^2%	t_{tab} at 95%, n-2	Calculated t-value $t_{cal}=/r/\sqrt{n-2}/\sqrt{1-r^2}$
Linear range	0.05-7.0(24)	0.024±0.027+0.271±0.007[LOT] m.M	0.9983,0.9965,99.65	2.074<< 79.992	
Working range	0.05-8.0(25)	0.043±0.040+0.005±0.010[LOT] m.M	0.9961,0.9922,99.22	2.069<< 54.190	
Dynamic range	0.05-8.5 (26)	0.066±0.055+0.253±0.013[LOT]m.M	0.9928,0.9857,98.57	2.064<<40.692	
Scatter plot	0.05-9.0(27)	0.091± 0.068+0.242±0.014[LOT]m.M	0.9888,0.9776,97.76	2.060<<33.065	

n= number of measurements, Ŷzi : estimated value without unit by spectrophotometric classical method t_{tab}=t0.05/2, n-2.

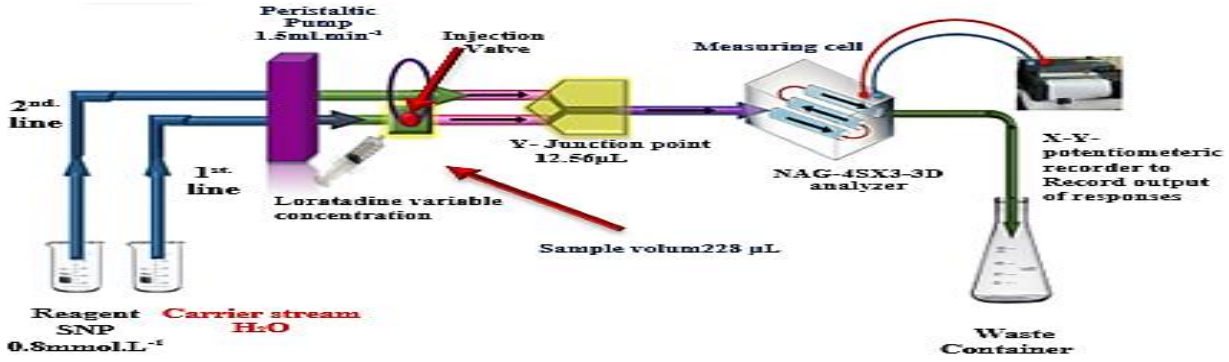

Fig. 3s. Determination of LOT using a flow gram technique showing the ideal physical and chemical parameters

Table 2s. Results of linear regression using a first degree equation of the form =a+b x under ideal circumstances

mode	*Range of [Loratadine] m.M(n)*	$\hat{Y}_{Z\,i}=a \pm S_a\, t+b(\Delta y/\Delta x_{mmol/L})\pm S_b\, t$ *[LOT] m.M at confidence level 95%, n-2*	*r, r², R²%*	*t_{tab} at 95%, n-2*	*Calculated t-value $t_{cal}=/r/\sqrt{n-2}/\sqrt{1-r^2}$*
Linear range	0.01-10(21)	35.810±37.927+281.249±7.619[LOT] m.M	0.9984,0.9968,99.68	2.093	<< 77.273
Working range	0.01-11(22)	-14.584±112.360+301.684±20.808 [LOT] m.M	0.9892,0.9786,97.86	2.086	<< 30.245
Dynamic range	0.01-15(23)	33.276±122.510+286.244±19.960 [LOT]m.M	0.9884,0.9769,97.69	2.080	<<29.830
Scatter plot	0.01-25(25)	396.339± 304.824+191.126±35.045[LOT]m.M	0.9203,0.8470,84.70	2.069	<<11.284

n: no. of measurement, $\hat{Y}_{Zi}$ (mV); estimated response(n=3) in mV for developed method and $t_{tab}= t_{0.05/2,\,n-2}$,

Table 3s. The detection limit of Loratadine

Practically based on the gradual dilution for the minimum concentration in scatter plot		Theoretical based *slope x=3S_B/slope*	Theoretical based $\hat{Y} = Y_b + 3Sb$	Limit of quantitative L.O. Q $\hat{Y}=Y_b+10S_b$
Newly developed method (8)µ.M	Classical method spectrophotometric method			
261.890 ng/sample	19.144µg/ sample	1.150µg /sample	48.928µg/sample	0.163 mg/sample

$\hat{Y}$: Estimated response (mV), X: value of LOD based on the slope (depend on linear dynamic range), S_b: standard deviation of blank(n=13) equal to $S_{y/x}$ (residual), (LOD depend on linear equation of linear range due to low $S_{y/x}$), Y_b: average response for blank= intercept (a).

Table 4s. Repeatability of Loratadine

Concentration of Loratadine mM	$\bar{Y}_{Zi.}$ *(n→6)*	*(R.S.D.%)*	*C.I*
4	1008	0.13	1008±1.347
10	2866	0.08	2866± 2.437

$t_{0.05/2,5}$=2.571, n= number of injections

Table 5s. Standard addition results for the determination of LOT in four samples of drug using NAG - 4SX3 - 3D analyzer for developed method, UV- Spectrophotometer method (Classical method)

No. of sample	Commercial Name, Company Content Country	Type of method: NAG4SX3 analyzer (mV); UV- Spectrophotometer at λ_{max}= 275nm. — Confidence interval For the average weight of Tablet $\bar{\omega}i \pm 1.96\ \sigma_{n-1}/\sqrt{n}$ at 95% (g)	Theoretical content for the active ingredient at 95% (mg) $Wi \pm 1.96\ \sigma_{n-1}/\sqrt{n}$	LOT					Equation of standard addition at 95% for n-2, r,r²,R²%
				0ml	0.4ml	0.8ml	1.2ml	1.6ml	$\hat{Y}_i(mV)=a\pm s_a t+b\pm s_b t$ [LOT]m.M, $r,r^2,R^2\%$
				0	0.8	1.6	2.4	3.2	
				0ml	0.5ml	0.6ml	0.7ml	0.8ml	$\hat{Y}_i=a\pm s_a t+b\pm s_b t$ [LOT]m.M, $r,r^2,R^2\%$
				0	1.0	1.2	1.4	1.6	
1	Lartin, WADI ALRAFIDAIN, 10 mg, Iraq	0.12193±0.00015	10±0.0123	100	330	510	700	860	$\hat{Y}_i$(mV)= 122.000±53.053+236.250±27.076 [LOT]m.M 0.9981,0.9961,99.61
		0.12193±0.00015	10±0.0123	0.071	0.432	0.483	0.532	0.593	$\hat{Y}_i$=0.081±0.053+0.328±0.045 [LOT]m.M 0.9972,0.9945,99.45
2	Lorasam, SDI, 10mg, Iraq	0.12184±0.0006	10±0.0492	130	365	568	788	1000	$\hat{Y}_i$(mV)=137.600±19.916+270.375±10.163 [LOT]m.M 0.9998,0.9996,99.96
		0.12184±0.0006	10±0.0492	0.064	0.321	0.393	0.421	0.489	$\hat{Y}_i$=0.064±0.033+0.263±0.029 [LOT]m.M 0.9983,0.9967,99.67
3	Lohist, SAOG,10mg, Oman	0.0982±0.0008	10±0.0815	108	277	453	644	800	$\hat{Y}_i$(mV)=106.200±21.727+218.875± 11.86 [LOT]m.M 0.9996,0.9992.99.92
		0.0982±0.0008	10±0.0815	0.053	0.268	0.348	0.359	0.406	$\hat{Y}_i$=0.055±0.051+0.223±0.045 [LOT]m.M 0.9945,0.9891,98.91
4	Pressing, Hemofarm ,10mg, Serbia	0.11137±0.0007	10±0.0629	150	388	610	840	1090	$\hat{Y}_i$(mV)= 149.200±20.365+291.500±10.392 [LOT]m.M 0.9948,0.9895,98.95
		0.11137±0.0007	10±0.0629	0.088	0.432	0.509	0.562	0.653	$\hat{Y}_i$=0.087±0.029+0.348±0.024 [LOT]m.M 0.9993,0.9986,99.86

$\hat{Y}_{Zi}$: Estimated response in mV for developed method and without unite for UV-Sp. method, , $t_{tab}= t_{\frac{0.05}{2},\infty}$=1.96 at 95%, $t_{tab}= t_{0.05/2,3}$=3.182 for n=5, UV –Sp.: UV –Spectrophotometric method, using volume of cell (quartz) 4 ml in UV–Spectrophotometric method

Table 6s. Summary of results for practical content, (Rec %) efficiency for determination of LOT in four samples of drugs and t-test for comparison two methods

No. of sample	Type of method: NAG4SX3 Analyzer, UV- Spectrophotometer at λ_{max}= 275nm. Practical [m.M 10 ml / Practical [m.M in100 ml / Practical weight of LOT in(g)	Weight of LOT in e sample(g) $\bar{W}_{i(g)} \pm 4.303\ \sigma_{n-1}/\sqrt{}$ / Weight of LOT in tablet $\bar{W}_{i(mg)} \pm 4.303\sigma_{n-1}/$ (mg)	Efficiency of determination Rec.%	Individual t-test between claimed value & practical value $(\bar{W}_{i(mg)}-\mu)\sqrt{n}/\sigma_{n-1}$	Paired t –test Compared between three methods: $t_{cal}= \bar{w}d\sqrt{n}/\sigma^{*}_{n-1}$	t_{tab} at 95%confidence level (n-1)
1	0.5164 / 5.1640 / 0.1977	0.1977±0.0378 / 10.328±1.973	103.28	0.715<4.303	Newly developed methodology and UV-spectrophotometric (classical method) $\bar{W}d$ =0.3115 σ^{*}_{n-1}= 0.2851 /-2.185/ < 3.182	
	0.2454 / 4.9084 / 0.1879	0.1879±0.0350 / 9.8169±1.826	98.17	/-0.431/<4.303		
2	0.5089 / 5.0892 / 0.1949	0.1949±0.0398 / 10.1786±2.080	101.79	0.369<4.303		
	0.2414 / 4.8288 / 0.1849	0.1849±0.0450 / 9.6577±2.348	96.58	/-0.627/<4.303		
3	0.4852 / 4.8521 / 0.1858	0.1858±0.0379 / 9.7042±1.978	97.04	/-0.643/<4.303		
	0.2448 / 4.8964 / 0.1875	0.1875±0.0370 / 9.7929±1.932	97.93	/-0.461/<4.303		
4	0.5118 / 5.1184 / 0.1960	0.1960±0.0205 / 10.237±1.072	102.37	0.951<4.303		
	0.2484 / 4.9672 / 0.1902	0.1902±0.0380 / 9.9343±1.987	99.34	/-0.142/<4.303		

μ: claim value (10mg), ϖi : practically weight in mg, $\bar{W}$d : average weight of difference between two type of method (developed & classical), σ_{n-1}:standard deviation of different(paired t-test), n:(no. of sample) = 4, $t_{tab}=t_{0.05/2\ ,\ n-1} = t_{0.025,3}$ = 3.182 (for individual t-test & paired t-test), classical method: UV–Spectrophotometric method.

Table 7s. Summed up the results for two different methods in addition to quoted value and four different samples for ANOVA

A			
	Type of method		
Commercial name Country	Quoted value (Official method)	Newly developed methodology LOT-SNP system	Classical method (UV-Spectrophotometric)
Lartin – Iraq	10	10.328	9.8169
Lorasam – Iraq	10	10.1786	9.6577
Lohist – Oman	10	9.7042	9.7929
Pressing- Serbia	10	10.237	9.9343
$\bar{X}_1$ =	10	10.11195	9.80045
σ_{n-1}=	0	0.278698	0.113462
S_i^2=	0	0.077672	0.012874

$\bar{X}$: average of values, σ_{n-1}: standard deviation, s^2= variance

Table 8s. The analysis of variance (ANOVA) was conducted to compare the data obtained from four distinct samples originating from four separate firms

	B				
Source	Sum of squares (SSq)	Df	Mean square (MSq)	F_{cal}	$F_{critical}$
Between group	SS_B=0.1494	2	MS_B=0.07469	3.712<4.26	
Within groups	SS_W=0.1811	9	MS_W=0.02012		
Total	0.3305	11	0.09481		

df = degree of freedom, F_{tab}= $F_{0.95,V1,V2}$= $F_{0.95,2,9}$= 4.26 at 95% confidence level, K= number of group =4, N=number of measurements or sum of the samples for the groups (i.e) =n_1+n_2+……+n_i =16 , SS_B = Sum of squares between group , SS_W = Sum of squares within group, MS_B = SS_B/ K-1 & MS_W = SSw/ N-K, F_{cal} = MS_B / MS