

**DETERMINATION OF SOME POTABLE WATER
INDICATORS IN EVALUATION OF CHEMICAL
SAFETY OF POTABLE WATER IN REPUBLIC OF
MACEDONIA**

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Physical and chemical drinking water indicators provide baseline information for water quality and help identify trends or changes in water quality over time. The main objective of this study is determination of some physical and chemical parameters in potable water in the Republic of Macedonia in order to make physical and chemical safety evaluation of potable water which is distributed to the consumers.

The study included a total of 518 samples of potable water from different supply as central water supply systems, local water supply systems and individual water supply systems for the period from October to May 2013.

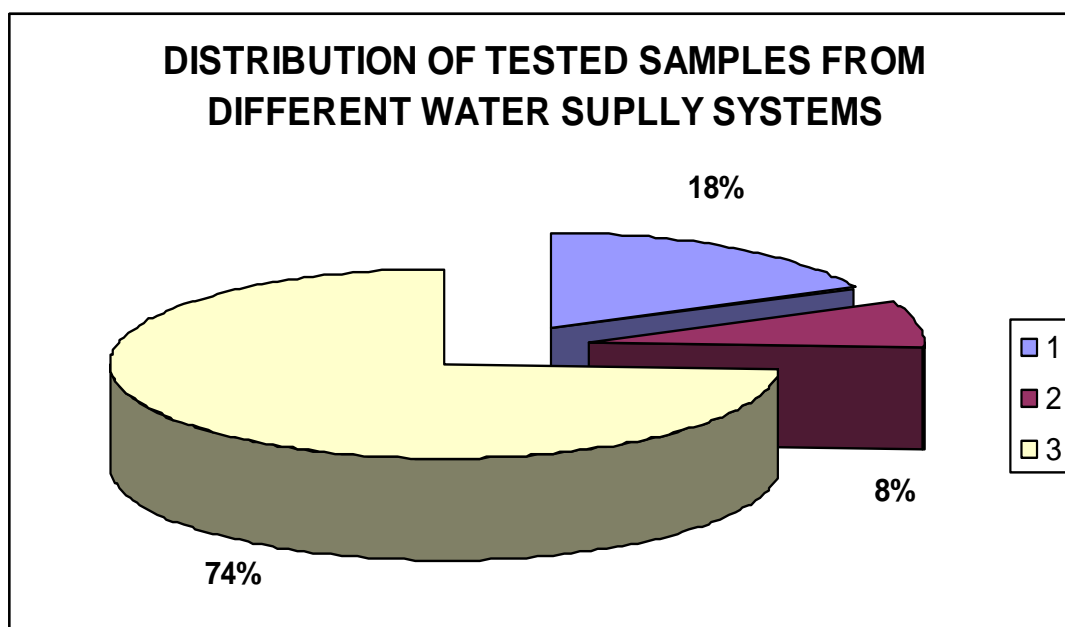


Figure 1. 1. Central Water Supply Systems; 2. Local Water Supply Systems; 3. Individual Water Supply Systems

Testing of all water samples was performed on the content of: routine components, major inorganic components, trace metals, trihalomethanes and pesticides.

Table 1. The results obtained for some routine components and major inorganic components in tested samples of potable water (n = 518)

Tested parameter	Minimum value	Maximum value	Mean value	Units	Maximum Allowable concentration
Color	0	0.01	-	Pt-Co scale	20
Turbidity	0	123	2.51	NTU	1.5
pH	7.02	8.1	7.58		6.5 - 9.5
KMnO ₄ consumption	0.95	5.67	1.93	mg/L	8.0
Total dry material after evaporation	323	1497	521.3	mg/L	1000
Dry material at 180 °C	18	1723	360.3	mg/L	1000
Carbonates	0.5	30.8	12.7	mg/L	0.1
Hydrogen carbonates	11	671	275.1	mg/L	1000
Total hardness	0.29	77.4	12.1	dH ⁰	20
m – alkalinity	<0.1	9.2	3.2	mmol/L HCl	0.1
p-alkalinity	<0.001	0.1	0.002	mmol/L HCl	0.1
Conductivity	454	1701	771.3	µS/cm	1000
Ammonium	<0.01	0.01	-	mg/L	0.5
Nitrite	<0.01	2.37	0.05	mg/L	0.1
Nitrate	<0.1	140.1	10.8	mg/L	50
Chlorine	1.2	75.1	17.2	mg/L	250
Sulfates	0.66	394	39.4	mg/L	250
Fluorine	<0.1	1.18	0.20	mg/L	1.5
Calcium	0.64	458.5	58.1	mg/L	200
Magnesium	0.39	84.6	17.5	mg/L	50

Table 2. The results obtained for analysis of some trace metals in tested samples of potable water (n = 518)

Tested parameter	Minimum value	Maximum value	Mean value	Units	Maximum Allowable concentration
Lead	<0.01	0.092	0.002	mg/L	0.01
Cadmium	<0.01	0.006	0.003	mg/L	0.003
Cobalt	<0.01	0.012	0.001	mg/L	0.05
Nickel	<0.01	0.12	0.007	mg/L	0.02
Chromium total	<0.01	0.006	0.003	mg/L	0.05
Arsenic	<0.1	22.4	2.43	µg/L	10
Aluminium	<0.1	220.3	78.6	µg/L	200
Copper	<0.1	0.42	0.052	mg/L	2
Nickel	<0.1	0.12	0.001	mg/L	0.02
Iron	<0.1	5.3	0.14	mg/L	0.2
Zink	0.1	2.3	1.15	mg/L	3
Manganese	<0.1	0.75	0.02	mg/L	0.05
Mercury	<0.1	0.4	0.05	µg/L	2

Table 3. The results obtained for analysis of some halogenated hydrocarbons in potable water (n = 518)

Tested parameter	Minimum value	Maximum value	Mean value	Units	Maximum Allowable concentration
Chloroform	<0.1	0.4	0.05	µg/L	10
Dibromochloromethane	<0.1	1.1	0.04	µg/L	10
Bromodichloromethane	<0.1	0.6	0.02	µg/L	10
Bromoform	<0.1	0.3	0.01	µg/L	10
Trichlorethylene	<0.1	0.7	0.05	µg/L	10
Tetrachlorethylene	<0.1	0.4	0.03	µg/L	10

Table 4. The results obtained for analysis of some pesticides residues in potable water (n = 518)

Tested parameter	Minimum value	Maximum value	Mean value	Units	Maximum Allowable concentration
Aldrin	<0.1	<0.1	-	µg/L	0.1
Dieldrin	<0.1	<0.1	-	µg/L	0.1
α HCH	<0.1	<0.1	-	µg/L	0.1
β HCH	<0.1	<0.1	-	µg/L	0.1
γ HCH	<0.1	<0.1	-	µg/L	0.1
σ HCH	<0.1	<0.1	-	µg/L	0.1
HCB	<0.1	<0.1	-	µg/L	0.1
Endrin	<0.1	<0.1	-	µg/L	0.1
Endosulfan	<0.1	<0.1	-	µg/L	0.1
Endosulfan sulfate	<0.1	<0.1	-	µg/L	0.1
2,4' - DDD	<0.1	<0.1	-	µg/L	0.1
4,4' - DDD	<0.1	<0.1	-	µg/L	0.1
2,4' - DDE	<0.1	<0.1	-	µg/L	0.1
4,4' - DDE	<0.1	<0.1	-	µg/L	0.1
2,4' - DDT	<0.1	<0.1	-	µg/L	0.1
4,4' - DDT	<0.1	<0.1	-	µg/L	0.1
Methoxychlor	<0.1	<0.1	-	µg/L	0.1
Atrazine	<0.1	<0.1	-	µg/L	0.1
Propazine	<0.1	<0.1	-	µg/L	0.1
Simazine	<0.1	<0.1	-	µg/L	0.1
Parathion	<0.1	<0.1	-	µg/L	0.1
Methyl – parathion	<0.1	<0.1	-	µg/L	0.1
Chlorpyrifos	<0.1	<0.1	-	µg/L	0.1
Chlorpyrifos-methyl	<0.1	<0.1	-	µg/L	0.1
Diazinon	<0.1	<0.1	-	µg/L	0.1
Ethion	<0.1	<0.1	-	µg/L	0.1
Malathion	<0.1	<0.1	-	µg/L	0.1

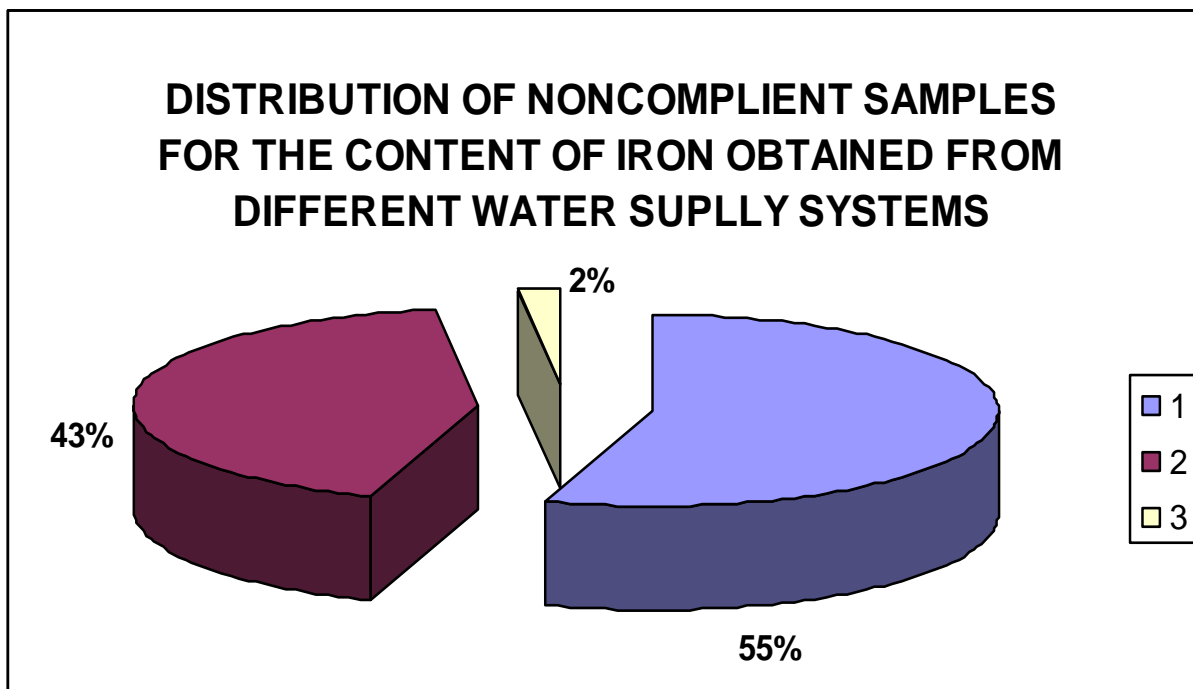


Figure 2. 1. Individual Water Supply Systems; 2. Local Water Supply Systems; 3. Central Water Supply Systems

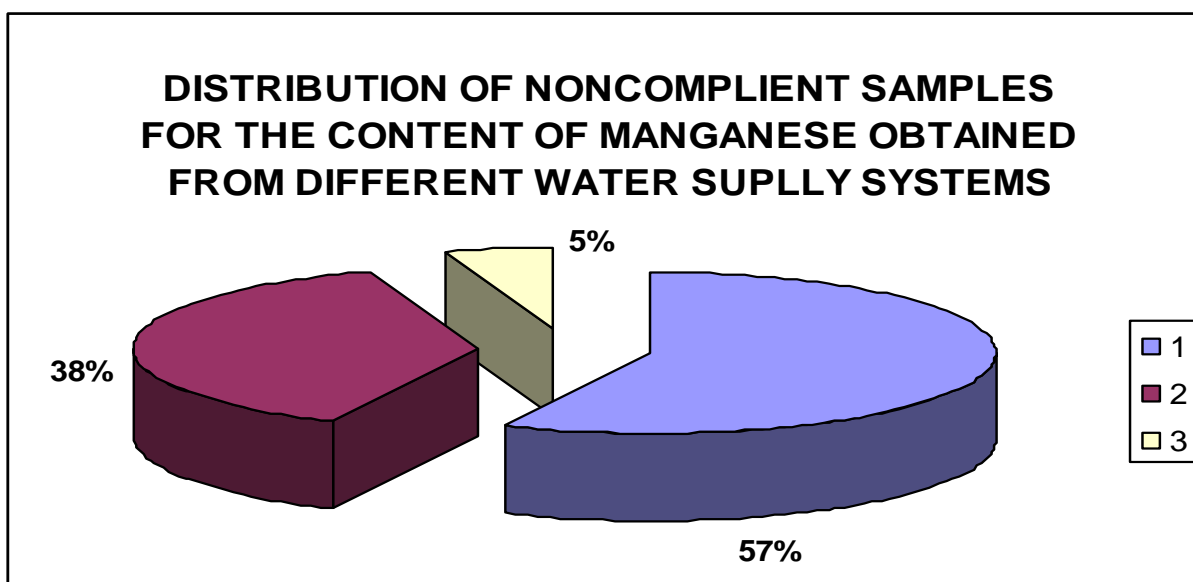


Figure 3. 1. Individual Water Supply Systems; 2. Local Water Supply Systems; 3. Central Water Supply Systems

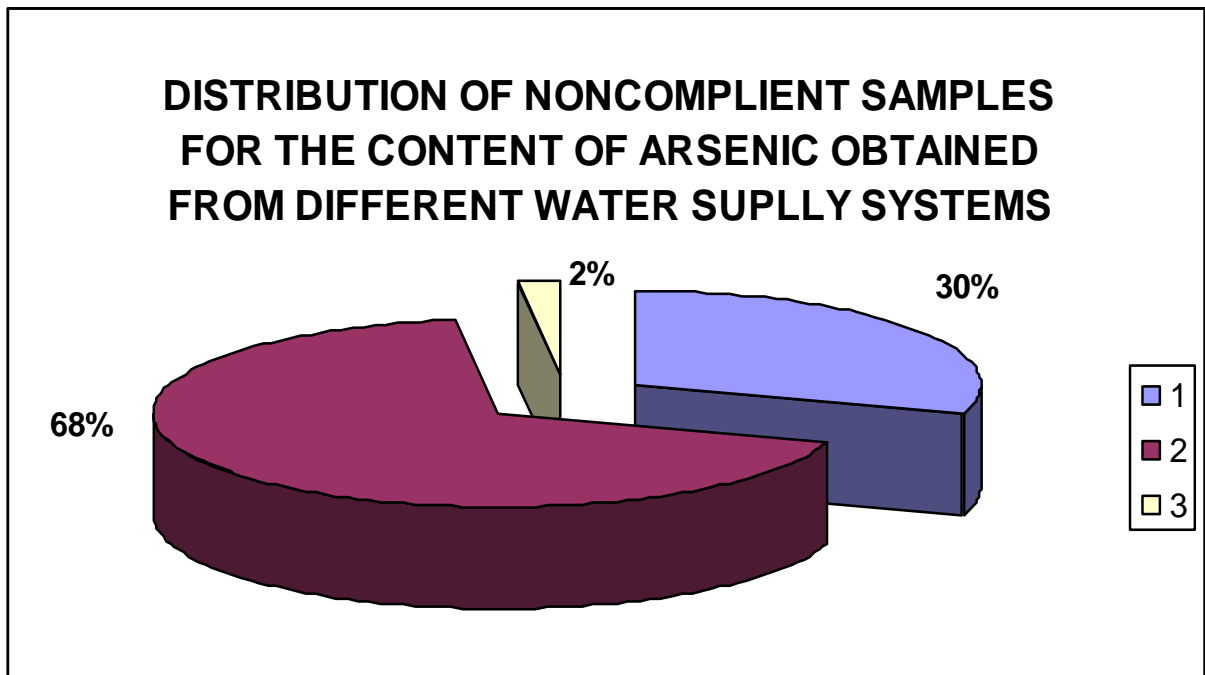


Figure 4. 1. Individual Water Supply Systems; 2. Local Water Supply Systems; 3. Central Water Supply Systems

CONCLUSIONS

The obtained results showed that the percentage of the noncompliant samples was within the range from 12.1% for samples obtained from central city water systems to 33.33% for samples from central rural water supply systems. In the majority of incompliant samples, the content of iron, manganese, arsenic, turbidity, conductivity and PIV oxidisability was above established MAC. The results showed that 19.85% from a total of 518 tested samples were incompliant and therefore unsafe for human consumption.