The cities of Konya, Kayseri, Ankara, Sivas, Kyrsehir and Nevsehir, all located in Central Turkey, are well-known for their famous historical buildings and monuments belonging to prehistoric to medieval civilizations. With the Hittite monuments and Seljuk-Ottoman mosques, medresses and caravansaries, the city of Konya is the most distinctive among others. Especially, the buildings are significant for the identity of the Seljuk and Ottoman architecture, which was dominant during the period of 11th and 20th centuries. Travertines, andesites and granites are the most used rocks for construction purpose by these two dominant empires in the Middle East. The buildings have suffered stone weathering since their construction and the preservation of these buildings has become a great issue for the past decades. The source region of the rocks used in these buildings as well as Hittite monument (dacite was used) at Eflatun is displayed in Fig. 1.

The weathering processes can be classified as chemical (Malpas et al., 2001; Duzgoren-Aydın et al., 2002), physical (Colman, 1981; Badalyan et al., 1996) and biological (May and Lewis, 1988; May et al., 2000). The chemical processes are chiefly promoted by the action of air pollutants such as SO₂, NOₓ, HNO₃, O₃, H₂SO₄ and particulates of different origin (Winkler, 1966). When these pollutants are transferred to rock surfaces by dry and wet deposition, salt crystallisation take place. If these crystallisations is in crack surfaces of the stones, the effect of salt crystallization is very intensive. The salt crystallization effect on the stones of travertine, andesite and granite used in the central Anatolian city of Konya throws light on the mechanism of the chemical processes responsible for deterioration of the rocks.

The quantification of salt weathering of the samples was measured by assessing the Dry Weight Loss (DWL) of the rocks. There have been many laboratory tests proposed for DWL determinations. The most used tests are the American Standard Test or ASTM (C-88, C-128), the Germany Standard Test or DIN (52111) and the Spanish Standard Test or UNE-EN (12370). All these tests have three stages: immersion (total), drying and cooling. In this study, the Spanish Standard Test was followed by DWL assessments. In this test, the samples were 7 cm cubes and a 14% w/w Na₂SO₄ solution was utilized. In the immersion stage, clean and dry rock samples were settled into a container and

Fig.1. Location map of the historical buildings (Konya, Sille, Kiziloren), monument (Eflatun) and the quarries (Karakaya, Sille, Bekdemir) of rocks.
covered with the solution at 20°C for 4 hours. In the drying stage, the samples were taken out of the container and settled into the oven at 60°C for 16 hours. The time-length of this cycle is 24 hours and the similar procedure was repeated for 15 days (total 15 cycles). The solution was changed every five cycles, as the samples lost weight. After 15 days, the tested samples were cleaned with pure water to eliminate salt. The samples were then dried until a constant weight reached. The dry weight loss was then calculated at the end of this stage.

The microscopic studies revealed that the andesites of Sille have approximately 30% plagioclase, 15% biotite, 10% hornblende and 41% volcanic glass as matrix, 3% quartz and 1% opaque minerals. The texture is overwhelmingly porphyritic. The granites generally are composed of quartz (30%), plagioclase (30%), orthoclase (20%) and biotite (20%). The holocrystalline texture is dominant in these rocks. The Godene travertines are almost made up of 100% calcite with rarely seen crystalline variety. The calcites are idiomorphic with high reflectance. The DWL results of granite, andesite and travertine samples are shown in Table 1. In general, the DWL values for the granites can be accepted as zero.

This is the lowest result for the rocks subjected to the present study. The andesites of the Sille (Konya) widely used in present day building construction, have the highest (about 43%) DWL values. Thus, it can be interpreted that this rock type is the weakest against salt alteration effect. In this manner, the strongest rocks are the granites irrespective of their type and source. On the other hand, with its 0.2% DWL values on average, the travertine of Godene (Konya) can also be considered as relatively strong rocks against the effect of salt crystallization.

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| Rock type        | DWL (%)*             | Rock source   |
|------------------|----------------------|---------------|
| Granite (Country flower) | 0.015395 ± 0.01694  | Kirsehir      |
| Granite (Kaman Rose)      | 0.04372 ± 0.039985  | Kirsehir      |
| Granite (Anatolian Grey)  | 0.04344 ± 0.010843  | Ortakoy-Aksaray |
| Andesite (Sille)          | 42.937 ± 13.61852   | Konya         |
| Dacite (Karakaya)         | 2.1700 ± 0.03022    | Konya         |
| Travertine (Godene)       | 0.20377 ± 0.301928  | Konya         |

*Each value represents an average of three results.