Insight into the Effect of Types of Sound on Growth, Oil and Leaf Pigments of *Salvia Officinalis*, L Plants

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Abstract: This study in an attempt to show how the rate of growth, oil% and leaf pigments of *Salvia officinalis* L plants was affected by types of different music. Plants were exposed to classical music, Jazz music and control. Both classical music (**Sonata Mozart No.7**) and Jazz music (**The Entertainer for Scott Joplin**) exposure were given for two hours per day at 8.0 to 9.0 am in the morning and again at 8.0 to 9.0 pm in the evening. Results showed that considerable variation was detected on growth characteristics, oil% and leaf pigments among the two types of music and the control. Classical music was measurably superior than using Jazz music and control in enhancing these parameters. A negative effects on these properties were attributed to using Jazz music relative to the control and those plants exposing to classical music. It is necessary to exposing *Salvia officinalis* plants to classical music twice per day at 8 to 9 am in the morning and again 8 to 9 pm in the evening to promote growth, oil% and leaf pigments.
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1. Introduction

Sage *(Salvia officinalis*, L.) belongs to family Lamiacaea. It is considered as remedy for coughs and bad colds, it is included in gargles and mouth washes. The fresh leaves are used to whiten the teeth, while the dried leaves are used cosmetically for restore the natural color to hair that is turning grey (**Harrison, 2012**). It has been used for different disorders including respiratory infections menstrual difficulties and digestive complaints. It is also believed to strength the sense and the memory. It is still current in the British pharmacopoeia as a specific for inflammations of the mouth, tongue and throat. It is used in some pharmaceutical preparations such as mouth washes, gargles, tooth pastes, employed as a fragrance components in soaps, shampoo, detergents, antiperspirants, colognes and perfumes, especially men's fragrance. The oil and oleoresin are used extensively for flavouring foods (mainly, meat products), soft drinks alcoholic beverages, especially vermouth. It also serves as a source of natural anti-oxidants (**Lawless, 1992; Turgut *et al*., 2009 and Chrpova *et al*., 2010**).

Music is an art form whose medium is sound and silence. It produces beauty of expression, emotion in multicellular organisms considered as sensitive for initial assaying of effects and testing new therapies. Sound is known to affect the growth of plants respond to music. Music can cause drastic changes in plants metabolism. The plants enjoy music and they respond to the different types of music (**Bidwell, 1974**).

Music sound has been an obvious impact on growth, flowering and nutritional status of the plants compared to noise and untreated control. The specific effect of the growth of plants subjected to sounds of varying intensity and frequency has been reviewed. Any environmental factor that places a biological system under stress can affect its performance and/or behavior. Plants feel pleasure in the presence of some music patterns as their biological signals are affected by different amounts and it has been reported that some musical sounds can also damage the plant tissues as well as (**Ekici *et al*., 2007**). Previous studies showed that if the plants are continually exposed to Jazz music for more than 10 days they will ultimately die (**Klein and Edsall, 1965**).

In contrast, the impact of soft and light music enhances the plant growth and increases yield. Soft and light kind of music has gentle vibrations that relax the plants tissues. **(Lawless, 1992)** Violin music considerably increases plants growth. Some researchers concluded that the gentle vibrations of a music helps in the rapid growth of the plants, making them stronger (**Chrpova *et al*., 2010)**. All this may help the farmers to increase the production of crops (**Klein and Edsall, 1965**).

Exposing the eight medicinal and ornamental plants namely Tageteserecta, *Catharanthus roseus*, *Trachyspermum amnai* L, *Dendanthemagran diflorum* L, *Hibiscus rosa* silences L, *Epipremam aureum* L. *Durantarepens* L, *Ocimum sanctum* L to the soft melodious music showed noticeable changes in growth. Subjecting these ornamental species to music (**Sharma *et al*., 2015**). Number of flowers and time of flowering were affected with music. The treated plants started to flower one week earlier as compare to the control plants (**Sharma *et al*., 2015**).

Singh, *et al*. (2013) disclosed that classical music was preferable than traffic noise in enhancing growth of common bean plant (*Phaseoius vulgaris*).

The previous results regarding the promoting effect of music on growth of plants were emphasized by the results of **Collius and Foreman, (2001)**; **Cai *et al*., (2014) and Vanol and Vaidy, 2014)**.

The merit of this study was testing the effect of types of music on growth, oil and leaf pigments behavior of *Salvia officinalis* L plants.

2. Material and Methods

This experiment was carried out during 2015 and 2016 seasons at a private Floriculture Farm located at Minia City, Minia Governorate. Seeds of *Salvia officinalis* L were obtained from the Research Center of Medicinal and Aromatic Plant Section, Giza and were sown in an unheated glasshouse on the second week of December for the two experimental seasons in clay pots of 10 cm diameter (two seeds/ pot) containing a clay sand at a ratio of 2:1 by weight. The seedling at the stage of 3-4 leaves and 8-10 cm in height were transplanted in large clay pots of 40 cm diameter and planted on the second week of March in both seasons.

Sixty-three plants were selected for achieving of this study. They were divided into three sets and labeled as

a) Plants exposing to Classical music.
b) Plants exposing to Jazz music.
c) Plants exposing to Silence music.

Each set was replicated three times seven plants/each. Each set was kept in the same environmental conditions and received the same external sound and the common and same horticultural practices.

Both classical music (**Sonata Mozart No.7**) and Jazz music (**The Entertainer for Scott Joplin**) exposure were given for two hours per day at 8.0 to 9.0 am in the morning and again at 8.0 to 9.0 pm in the evening. The control was given no external sound exposure. The pots were set at a distance of 35 cm from the speaker and classical music was played using normal laptop with speakers. The volume of classical music was constant throughout the exposure period (three months). Randomized complete block design (RCBD) with three replicates each contain seven plants were adopted.

During both seasons, the following measurements were carried out: plant height (cm); number of branches, plant, total fresh weight of herb (g/plant/seasons), total dry weight of herb (g/plant/seasons), percentage of oil in fresh herb (**Wilde *et al*., 1985 and Chapman and Pratt, 1987**), oil yield/ plant (ml) by multiplying 0.1% x herb fresh weight and dividing the product by 100, as well as photosynthetic pigments (mg/ g F.W) namely chlorophylls a & b, total chlorophylls and total carotenoids in the fresh leaves of the middle of branches (1st week of June) (**Hiscox and Israelastam, 1979**).

The obtained data was tabulated and statistically analyzed according to **Rangaswamy, (1995) and Rao, (2007).** Treatment means were compared using L.S.D. test at 5%.

3. Results

1- Effect of types of music on vegetative growth characteristics:

The obtained data in Figure (1) clearly show that exposing *Salvia officinalis* L plant to classical music significantly stimulated plant height, number of branches per plant and fresh and dry weight of herb/plant relative to exposing to Jazz music or kept the plants under silence conditions. Leaving the plant in silence (control) significantly was followed by enhancing these growth traits rather than exposing the plants to Jazz music. Unfavourable effects on growth characteristics were attributed to exposing the plants to Jazz music in terms of producing the lowest values of these growth characteristics. The highest values were recorded on the plants under classical music. These results were true during both seasons.

2- Effect of types of music on percentage of oil and oil yield/plant:

It is clear from the obtained data in Figure (2) that subjecting the plants to Jazz music significantly depressed the percentage of oil and oil yield/plant comparing to the exposure to classical music and the control treatment. Keeping the plants in silence significantly was superior than using Jazz music in enhancing oil % and oil yield/plant. Exposing the plants to classical music significantly surpassed the use of Jazz music and control treatment in improving oil% and oil yield/plant. The maximum values were recorded on the plants received classical music. Exposing the plants to Jazz music gave the lowest values. Similar results were announced during both seasons.

3- Effect of types of music on the leaf pigments:

It is noticed from the obtained data in Figure (3 & 4) that chlorophylls a & b, total chlorophylls and total carotenoids were significantly reduced with exposing the plants to Jazz music comparing to using classical music and the control. Keeping the plants without music (control) significantly enhanced these pigments relative to the exposure to Jazz music. Exposing the plants to classical music significantly was favourable than the other two sets namely exposure to Jazz music and the control. Significant differences on these plant pigments were observed

among the three sets (treatments). The exposure to classical music gave the highest values of plant pigments. Subjecting the plant to Jazz music significantly minimized these plant pigments. These results were true during both seasons.

4. Discussion:

Music not only affects the plant growth, but is also affects the concentrations of various metabolites when the plants exposed to music especially classical types, there was an increase in the concentrations of total and reducing sugars, protein, total phenols, starch and chlorophylls a & b compared to the control (**Sharma *et al*., 2015**), The positive action of music on growth and flowering aspects might be attributed to its impact on enhancing light tropism, uptake and translocation of water and nutrients, root development and cell division (**Retallack, 1973**). The results of **Wang *et al*. (2003) and Singh *et al*. (2013)** supported and gave good evidence for the promoting effect of music on building and biosynthesis of most organic foods, directly or indirectly which reflected on stimulating growth traits and flowering aspects.

These results regarding the effect of music on growth, oil and leaf pigments are in agreement with those obtained by **Wang *et al*. (2002); Ekici *et al*. (2007); Cai *et al*. (2014); Vanal and Vaidya (2014) and Sharma *et al*. (2015)**.

Conclusion:

It is concluded that exposing *Salvia officinalis* L plants to classical music gave good results on growth of plants. Plants grow faster when subjected to music Hence, this musical concept can be very useful in the field of Biochemistry, Horticultural, Physiology and Ecology. Music can be used in plant nurseries. The knowledge can be applied in agriculture to promote yield. This idea may help to solve the problem of starvation and world hunger in the future.

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Table1: Effect of different types of music on some vegetative growth aspects, oil%, oil yield per plant and leaf pigments of *Salvia officinalis* L plants during 2015 and 2016 seasons.

Treatment	Plant height (cm)		No. of branches/plant		Herb fresh weight/plant (g.)		Herb dry weight/plant (g.)		Oil%	
	2015	2016	2015	2016	2015	2016	2015	2016	2015	2016
1. Exposing to classical music	38.0	38.9	33.0	34.0	186.0	189.0	63.3	65.0	1.75	1.79
2. Exposing to Jazz music	34.0	35.3	28.0	27.0	170.0	168.6	56.0	57.8	1.60	1.59
3. Kept in silence (control)	36.0	37.0	30.6	31.0	181.0	179.0	59.2	61.4	1.67	1.70
New L.S.D at 5%	1.3	1.4	2.0	1.9	3.1	2.9	1.3	1.4	0.04	0.03
Characteristics	**Oil yield/plant (ml)**		**Chlorophyll a (mg/1g F.W)**		**Chlorophyll b (mg/1g F.W)**		**Total chlorophylls (mg/1g F.W)**		**Total carotenoids (mg/1g F.W)**	
	2015	2016	2015	2016	2015	2016	2015	2016	2015	2016
1. Exposing to classical music	2.040	1.099	1.591	1.582	0.580	0.589	2.0171	2.171	0.599	0.609
2. Exposing to Jazz music	1.072	1.041	1.486	1.482	0.461	0.471	1.947	1.953	0.482	0.502
3. Kept in silence (control)	1.095	1.071	1.550	1.532	0.530	0.536	2.080	2.068	0.550	0.570
New L.S.D at 5%	0.016	0.018	0.031	0.041	0.015	0.016	0.019	0.020	0.020	0.022

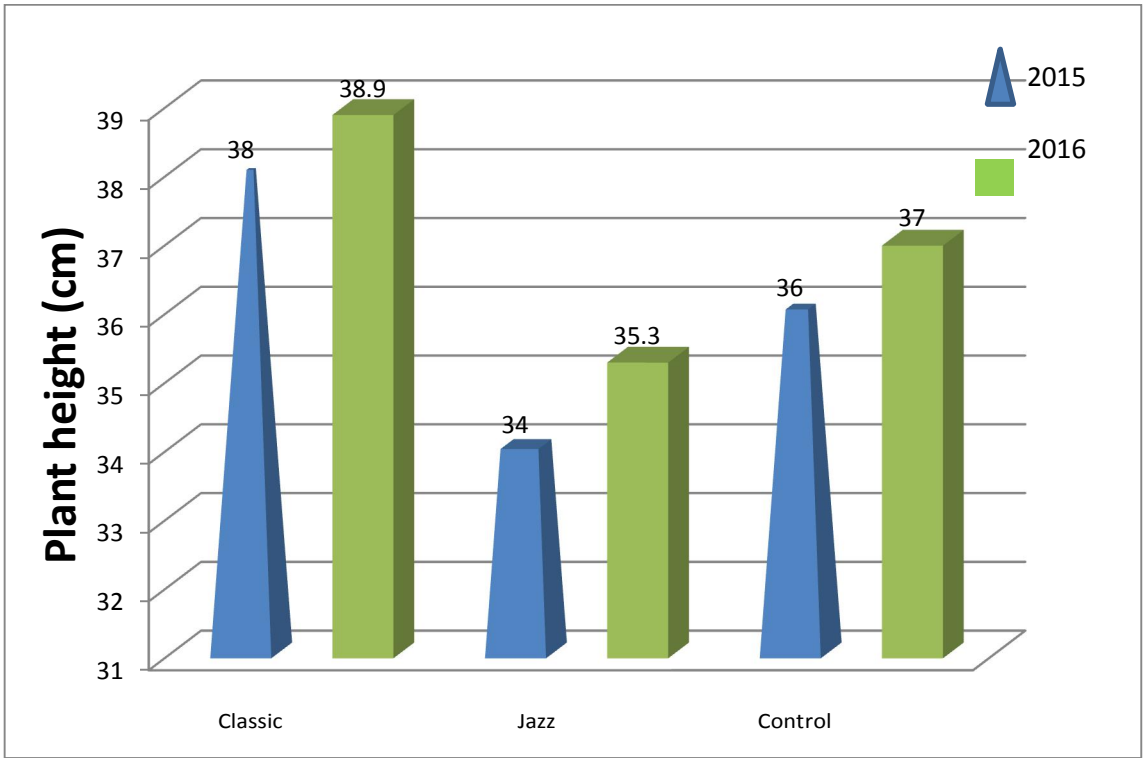

Fig. 1: Effect of different types music on the plant height (cm) of *Salvia officinalis* L plants during 2015 and 2016 seasons.

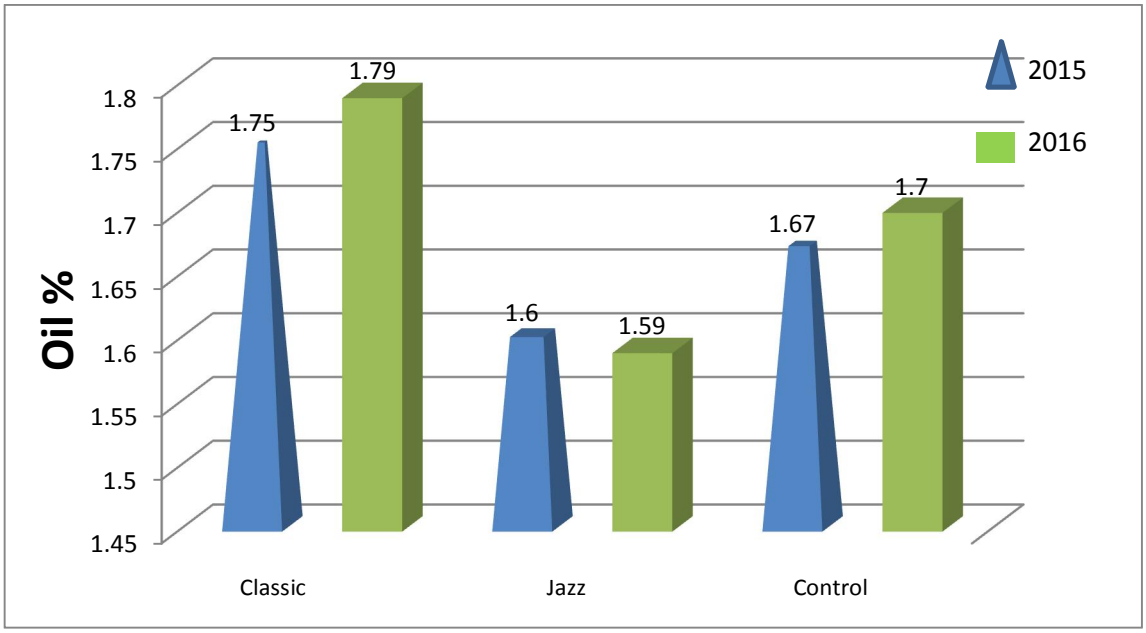

Fig. 2: Effect of different types music on oil % of *Salvia officinalis* L plants during 2015 and 2016 seasons.

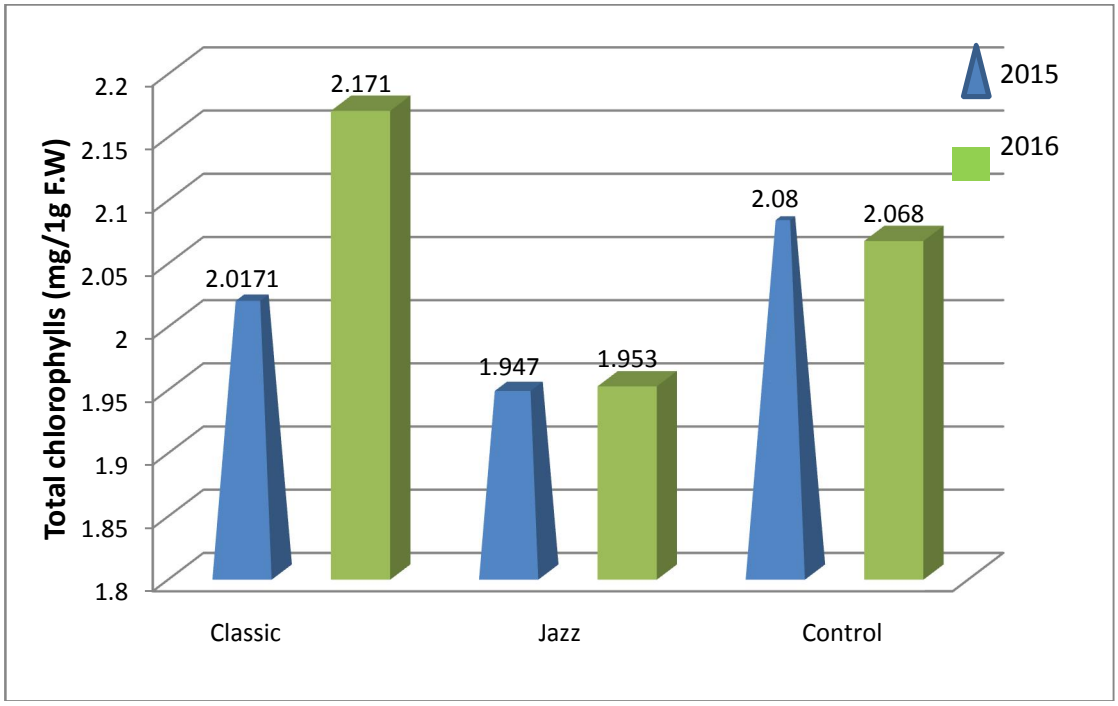

Fig. 3: Effect of different types music on total chlorophylls of *Salvia officinalis* L plants during 2015 and 2016 seasons.

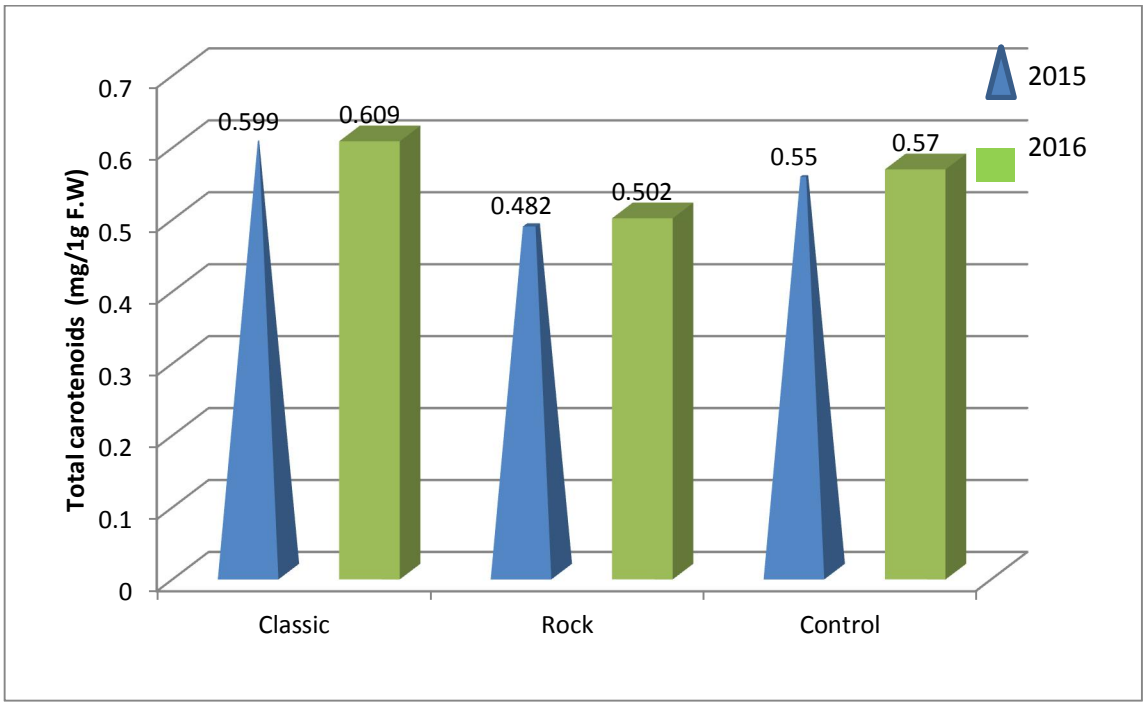

Fig. 4: Effect of different types music on total carotenoids of Salvia officinalis L plants during 2015 and 2016 seasons.

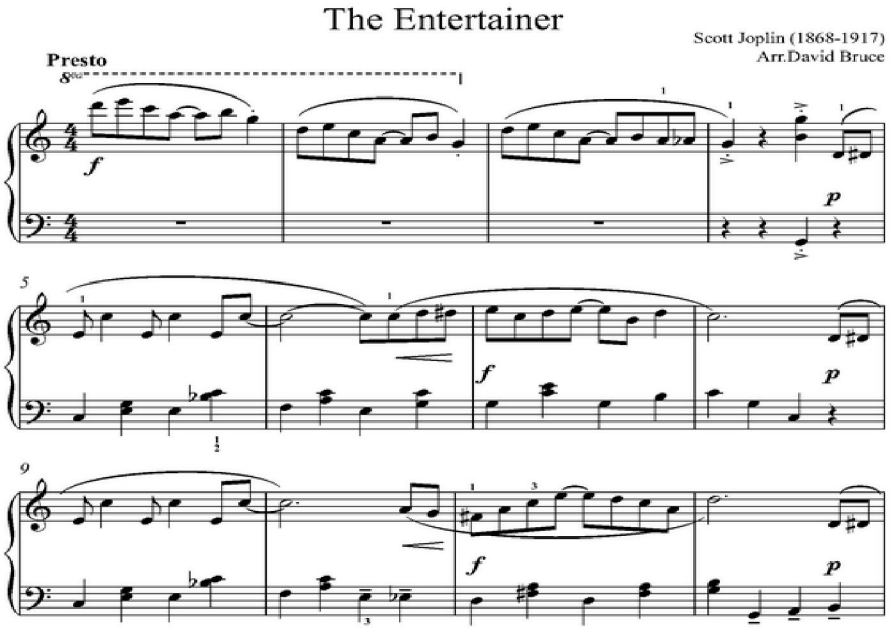

Fig. 5: Jazz Music (The Entertainer) for Scott Joplin.

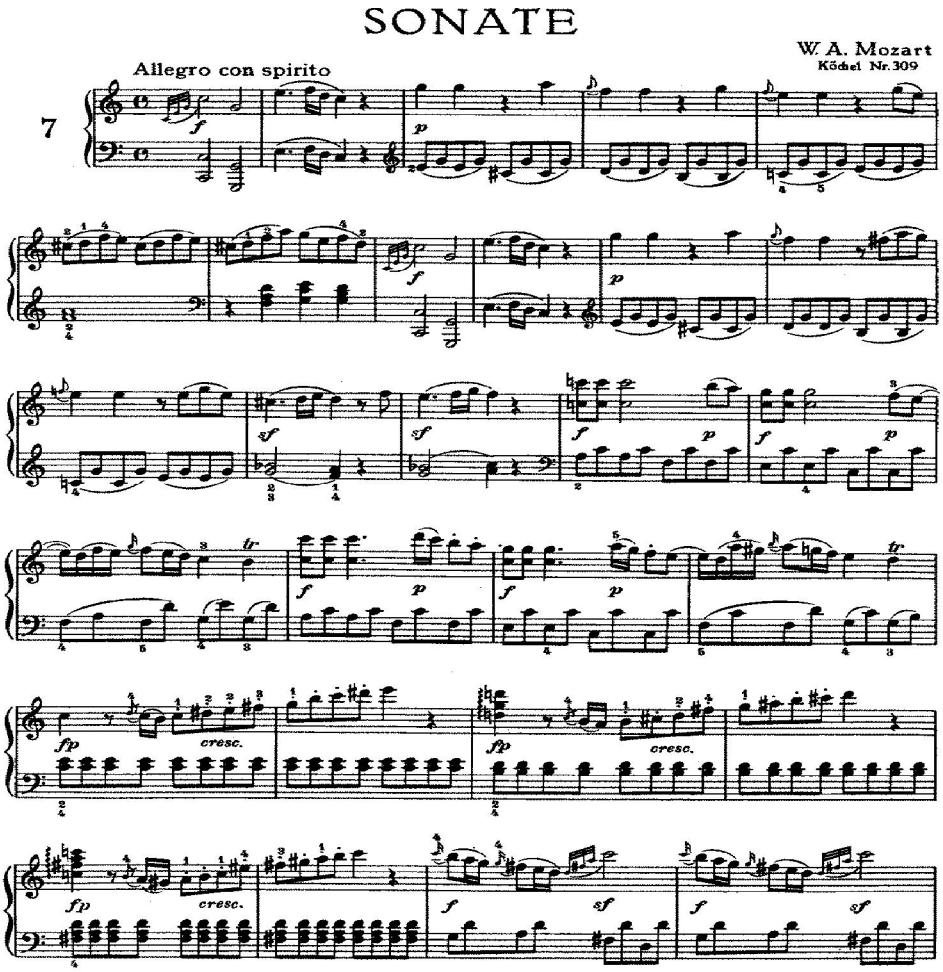

Fig. 6: Classic Music (Sonate No. 7) for Mozart.

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