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Biosynthesis of MgONPs and its effects on Carbohydrate and Protein Contain in*Triticumaestivum*L.

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Abstract

The aim studyis using eco-friend materials and cheap to create MgO nanoparticles ,the synthesis of oxide nanoparticles with the use of plant extract is a promising alternative to traditional and redchemical methods. The biologically synthesized MgO nanoparticles were characterized by UV–Visible spectroscopy, X-ray diffraction (XRD), scanning electron microscopy (SEM). This research dealt with effect of four concentrations of MgO nanoparticles chosen (0,100, 200,300) ppm with three methods (foliar plant ,seed soaking ,foliar + seed soaking) on the carbohydrate and protein content in the *Triticumaestivum*L.which was two varieties (rasheed and abaa 95) . The results showed increase in all vital indicators remember previous when exposed to the MgO Nanoparticles in comparative to the control treatment which gave the best carbohydrate andprotein content for foliar plants & seeds soaking treatment of the wheat plant . In spite of the magnesium is important to plant, this study found that when its existence in nanoparticles form may behave much better .

Key words: MgONPs,*Triticumaestivum*L. , carbohydrate and protein.

Introduction

The wheat crop is one of the most important strategic grain crops known and grown by humans because it is the main material in their food and the main source of energy they need, and conceder the predominant cereal crop and a staple food source for more than half of the world's population and is grown on larger area than any other crop and its world trade is greater than for all other crops combined , also it is easily stored and transported (FAO, 2014 ,FAO, 2017),in addition, its food components values is considered necessary to the human body because its grains contain 63-71% starch, 8-17% protein and water, 2-2.5% cellulose, 1.5-2% fat, 2-3% sugar, and 1.5-2 metal elements as well as gluten protein that it is important in baking industry (Breiman and Graur 1995, Jamali et al., 2000).. Wheat is a tall, annual plant with an early variety height from between two and six feet. The plant consists of leaves surrounding a slender stalk which ends at the top of wheat in spikes, or ears, of grain (International Starch Institute). each spike, ear, of grain consists of spikelets, which encompass the grain of wheat between the lemma and the palea (Valant, 2008).

Nanotechnology is a new emerging branch of technology, which has emerged as one of the leading fields of the science having tremendous application in diverse disciplines (Mobasser and Firoozi, 2016) The development of green processes for the synthesis of nanoparticles is evolving into an important branch of nanotechnology During recent times several groups have achieved success in the synthesis of nanoparticles using extracts obtained from plant part (Hussain et al., 2016),The use of plant as reducing power for synthesis of nonoparticalbecouse the important compounds in the plant extract are hydroxyl and carbonyl groups which act as reducing agent as well as stabilizing agent(Mohamad et al., 2014) , The magnesium oxide nanoparticles (MgONps) are considered high ionic metal oxides, which can

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have unusual surface areas and have distinct chemical and physical properties due to their small sizes and high density, as they have surface sites for the reaction(Stoimenov, 2002). The importance of magnesium in protein synthesis in plants is highlighted by its role in activating enzymes and the biosynthesis process of ATP.(Verbruggen and Hermans, 2013). Once the elemental Mg were taken up by the tobacco plants, they were probably bio distributed throughout the whole plant by the vascular network. After exposure to MgONPs in the matrix for 30 days the malondialdehyde, protein, and relative water contents did not differ significantly, indicating that the NPs in the test concentrations had no phytotoxicity and even promoted plant growth (Cai *et al.*, 2018) .Magnesium also is the structural component of polysaccharides, who acts as a stimulant for many enzymes important in the metabolism shifts of carbohydrates .In the other hand magnesium plays an important role when present in sufficient quantities to improve sugars in plant or move them to storage parts (Farhat, N *et al.*, 2016).

Material and methods

Synthesis of MgO Nanoparticles :*Allium cepa*(green leaves) was used as the source of the reducing agent for green synthesis of MgO nanoparticles. Firstly Prepare an alcoholic extract of the onion plant about (24 gm) dissolve with 240 ml of ethanol. Put them in a soxhlet for 4-5 hours. Then After drying the sample, 40 grams of extract are mixed with 40 grams of magnesium nitrate together and put into a magnetic stirrer to fix the solution to prepare MgO at a concentration of 2M NaOH solution was added to raise the pH value from (10-12) With PH meter drop-wise until the color changes to a brown or dull yellow(Ali et al., 2020) . The resulting solution is transferred to a centrifuge to separate the filtrate from the sediments, which will be washed twice to ensure the quality of the sample transferred to the 400 c^0 furnace oven to collect the MgO powder as white powder ,the Prepared powders were diagnosed using X-ray diffraction device (XRD) and scanning electron microscopy (SEM), andUV-Vis spectroscopy (UV).(Alradi, F. H., and Atia, E. A. 2020).

Preparation of MgONPs : MgONPs is prepared by dissolving 1gm from MgONPs in later of distilled water to be concentration 1000 ppm, as stock solution. Along with this to reduce mistake in chemical preparations is using titration law ($N_1 \times V_1 = N_2 \times V_2$), to prepare the studied concentrations (0,100,200 and 300) ppm , also to distilled water stirrer then quantities were placed separately in a 1 liter flask of 1 liter for each treatment (Chemiasof, 2011). The experiment was factorial, with three replicates and a completely randomized design (CRD). For each Wheat cultivar, there were nine treatments plus a control. The treatments were as follows (Ali and Ali, 2019):

T_1=(100+200 and300) ppmMgONPs by seed soaking method .
T_2=(100+200 and300) ppm MgONPs foliar spraying method.
T_3=(100+200 and300) ppm MgONPs seed soaking +foliar spraying method

Plant Cultivation: The experiment was conducted in agreenhouseof Al-Muthanna University\collage of science , on 1/12/2020, for the wheat plant varieties using two types, *Abaa 95* and *Al-Rasheed*.20 seeds were planted for eachPlant pot, the number of Plant pot is 72, each concentration has 3 replicates. We used three concentrations of MGO NPs which are (0,100,200, and 300)ppm, in three ways (soaking, spraying, soaking and spraying together).The tests were conducted on a date 26 /1 / 2021 and the experiment was completed on 18\4\2021.

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Total Soluble Protein : The protein was estimated using the follen method (Schacterale and Pollak,1973) is modified from method (Lowry *et al*., 1951) by measuring the visible density at 650 nm using the optical spectrometer.

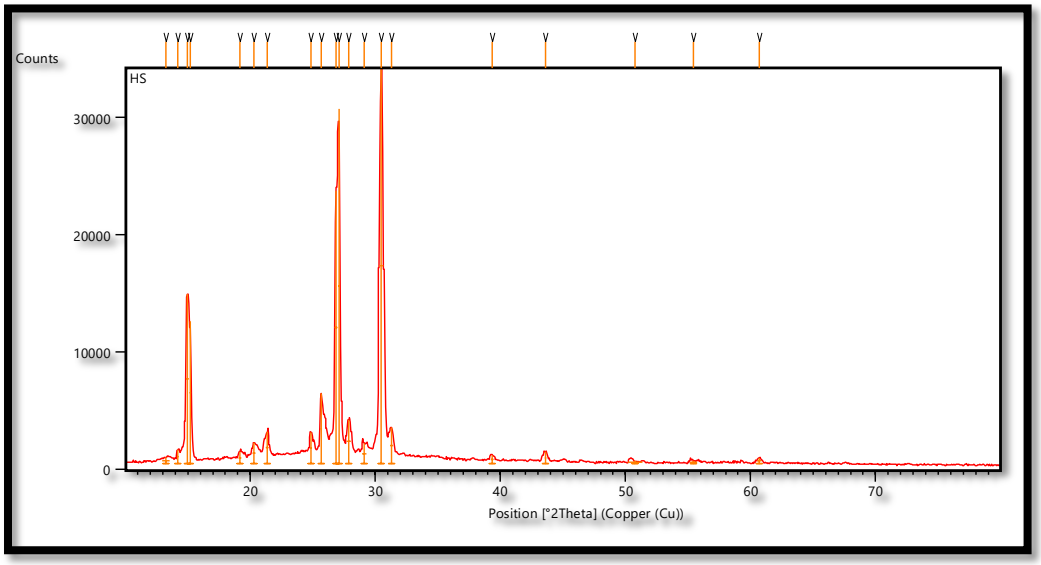
Estimation of Carbohydrates: Weight of 0.20 g of well-grounded leave and mix with distilled water (10 ml) and then put in a centrifuge for 15 minutes / 3000 min-1 cycle and aspirate the solution with filter paper, then pull 1 ml of leachate into a new test tube, add 5 ml of phenol at 5% and 5 ml of 80% sulfuric acid after stirring and shaking .The tubes are cooled and then photo resisted after proper dilution along a 488 nm wavelength using a spectro photometer (Al Wahbi and Bassallah, 2003).

Result and discussion

XRD analysis

The particle size and properties of the synthesized MgO nanoparticles was determined using powder XRD (figer .1) . The diffraction signals can not be indexed to cubic MgO and hexagonal Mg(OH)2 crystallites which are in good agreement with standard JCPDS card 78-430 and 07-0239 respectively(Mageshwari K., Sathyamoorthy R2012 ; Dhal J. P.,*et all* 2015)This means that the prepared sample has shows anew crystalline phase .

)Fig.1) X-ray diffraction pattern obtained for the MgO nanoparticles



The XRD pattern shows in (Fig. 1) . diffractionpeaks.The crystallite size of MgO nanoparticles was calculated from the main diffraction peak 1 using the Debye-Scherrer equation, as in (Mageshwari K., Sathyamoorthy R2012 ; Tamilselvi P., *et all* 2013)

$$D = \frac{K\lambda}{\beta \cos \theta}$$

Where β is full width at half maximum height (FWHM) of the diffraction peak at an angle θ (in Radians), λ is wavelength in (nm) of the XRD, and K is a dimensionless shape factor, with a value close to unity, normally taken as 0.9. The particle size of the MgO nanoparticle is 19.25 nm .

SEM analysis

the SEM photograph illustrating in (Fig. 2) shows the surfacemorphology of the prepared MgO nanoparticles. The imageshowsnanowires networkand the diameter of these nanowires

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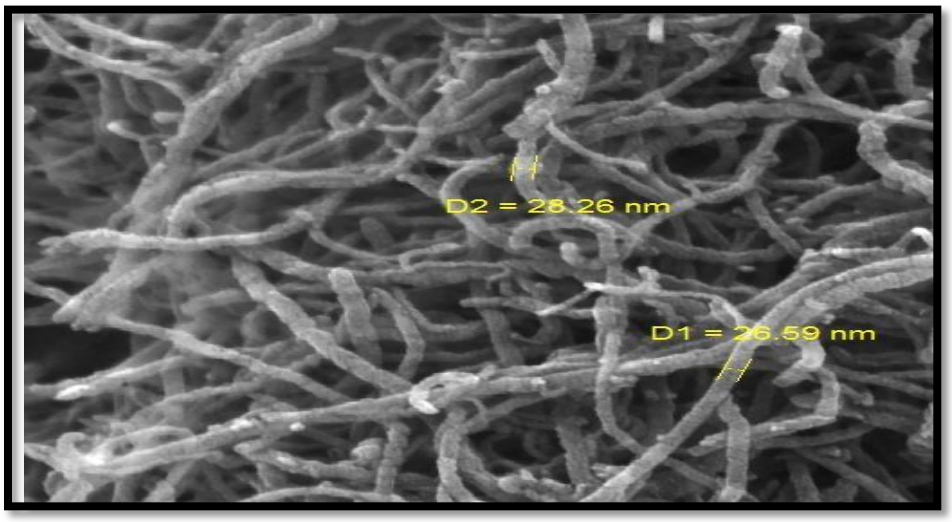
ranges between (26-28) nm .ascomparation to the literature in which the shapes were either spherical or cubic (Bdewi et al., 2015), while this study showed the one-dimensional nanoscale (1D) shapes, which were a nanowires .



(Fig. 2): SEM image of the prepared MgO nanoparticle

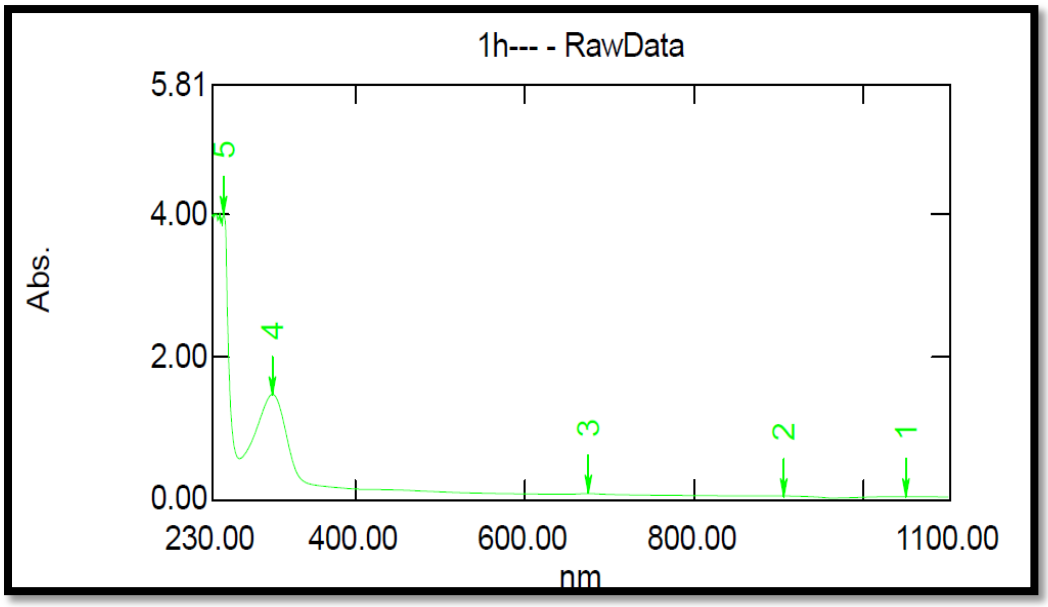
UV analysis

The UV-Vis spectroscopy of the prepared MgO was studied within a range of wavelength numbers ranging from (200 - 1100)nm .Where the spectrum showed an absorption band at (301.5) nm which is related to electronic transitions (π-π*).
(Bdewi et al., 2016) .

The energy gap for MgO nanoparticles is calculated through the following equation:

Where Eg =Energy gab ,e.v = electron volt

Whereas, the measured energy gap (Eg) =4.112 e.v



(Fig.3): UV analysis

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Effect of MgO NPs on carbohydrate contain

The results of the table show that increasing the level of magnesium levels from 100 to 300 ppm. Led to a significant increase in the amount of carbohydrate of given that the level was 100 ppm, a height of (44.42) g, superior to the comparison treatment, which amounted to (43.97)g at 200ppm share with *abaa 95* . Carbohydrate accumulation in the leaves induces feedback inhibition of Rubisco and reduces the rate of photosynthesis in Mg deficiency. Mg is also used to provide charge balance in the light reaction. Mg improve photosynthesisresulting in electron more productivity of oxygen and the development of ROS,.These results confirmed what aresearchers said about the use of nano magnesium at different levels has improved the characteristic of plant. (Cakmak 2005).

Table (1) Effect of MgO NPs concentrations and treatments on carbohydrateof wheat plant

Triticum	Treatment methods	Con. ppmMgO Nps				Interference species ×treatment	Effect of species	Effect of treatment
		0	100	200	300			
.abaa 95	T_1	17.34 s	29.33 h	25.86 k	25.68 l	25.65 d		
	T_2	19.95 r	43.97 b	30.36 g	23.13 o	26.74 c		
	T_3	20.85 q	44.42 a	32.23 e	21.23 p	29.68 a		
.rasheed	T_1	14.35 v	27.87 j	28.86 i	23.73 n	23.70 f		
	T_2	15.17 u	32.43 d	30.74 f	24.26 m	24.55 e		
	T_3	16.22 t	34.73 c	30.35 g	25.65 l	29.35 b		
Interference plant × Con.	*abaa 95*	19.38 g	39.24 a	29.98 c	24.54 e		27.86 a	
	rasheed	15.24 h	31.67 b	29.48 d	23.35 f		25.36 b	
Interference treatment × Con.	T_1	18.53 j	24.70 g	23.69 h	23.44 i			24.13 c
	T_2	17.56 k	38.20 b	30.54 d	27.36 f			27.50 b
	T_3	15.84 l	39.57 a	31.29 c	28.60 e			28.21 a
Effect of Con.		17.31 d	35.46 a	29.73 b	23.94 c			

* Mean values followed by the same letter are not significantly different according to Duncan's multiple range test ($P < 0.05$).

Effect of MgONPs on protein contain

The results indicated that the level of magnesium 100ppm amount applied to the wheat plant ,especially to the species (*.abaa 95)* recorded the highest significant values Under the probability level 5% of protein (8.81)g upon treatment (spraying And plant soaking) compared to the level of magnesium 200ppm , which gave an average of (8.37) g. Similarly, for the treatment of (soaking and spraying the plant), the largest significant differences in the

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results of the *rasheed* (7.41)g were also for the concentration of 100, followed by the second and first treatments, respectively. While the concentration 300 for MgONPs for the two Plants (4.02), (3.89)g, respectively, have the lowest values. MgO NPs has the capability to regulate the activity of enzymes associated with nitrogen metabolism, hence facilitate plants to obtain more nutrients. Also, the NPs convert the nitrogen to organic nitrogen in the form of proteins and chlorophyll pigments which ultimately increase the biomass and dry weight of the plants(Ramadan *et al.*, 2020) **.**

Table (2) Effect of prepared MgO NPs concentrations and treatments on protein of wheat plant

Triticum.	Treatment methods	Con. ppmMgO Nps				Interference species ×treatment	Effect of species	Effect of treatment
		0	100	200	300			
.abaa 95	T_1	2.25 kl	4.50 g	4.45 g	4.02 h	4.48 b		
	T_2	2.27 kl	8.37 b	4.54 g	3.10 i	4.53 b		
	T_3	2.29 k	8.81 a	5.25 e	2.75 j	4.76 a		
rasheed	T_1	1.75 m	4.50 g	4.50 g	3.89 h	3.65 d		
	T_2	2.12 l	7.02 d	4.83 f	3.97 h	3.82 c		
	T_3	2.16 kl	7.41 c	4.52 g	4.02 h	4.56 b		
Interference plant × Con.	*abaa 95*	2.27 g	7.22 a	4.75 c	3.96 e		4.38 a	
	rasheed	2.01 h	6.29 b	4.62 d	3.29 f		4.22 b	
Interference treatment × Con.	T_1	2.20 i	3.95 f	3.54 g	3.38 h			3.73 c
	T_2	2.19 i	7.69 b	4.67 d	4.47 e			4.52 b
	T_3	2.02 j	8.11 a	4.89 c	4.50 e			4.65 a
Effect of Con.		2.14 d	6.76 a	4.69 b	3.62 c			

* Mean values followed by the same letter are not significantly different according to Duncan's multiple range test ($P < 0.05$).

Conclusion

MgO NPs were successfully synthesized via green route using *Allium* plant leaf extract and employed for enhancement in seedling growth which led to improvement the amount of both carbohydrate and protein when the concentration 100ppm at foliar spray&seed soaking methods ,SEM photographs showed MgONPswere one-dimensional nanoscale (1D) shapes, which were a nanowires in shape and with an average size of 26.59 nm.

Reference

1) FAO, 2014. ProdStat. Core Production Data Base, Electronic resource under ⟨http:// faostat.fao.org/⟩ (assed30.05.2016)

Annals of R.S.C.B., ISSN:1583-6258, Vol. 25, Issue 6, 2021, Pages. 5129 - 5136
Received 25 April 2021; Accepted 08 May 2021.

2) FAO, 2017. The Date on the Word Production of Maize, Rice (Paddy) and Wheat in 2017.
3) Jamali, K.D.; Arain, M.D. and Mhamd, M. (2000). Comparative performance of semi-dwarf wheat (Triticumaestivum) genotypes. Wheat Information Service, 90: 45-46.
4) Breiman, A., &Graur, D. (1995). Wheat evolution. *Israel Journal of Plant Sciences*, *43*(2), 85-98.
5) Valant, V. (2008) 'General information of wheat', *Food for Thought: The Science, Culture, & Politics of Food*, pp. 1–12.
6) Mobasser, S. and Firoozi, A. A. (2016) 'Review of Nanotechnology Applications in Science and Engineering', *Journal of Civil Engineering and Urbanism*, 6(4), pp. 84–93.
7) Hussain, I. *et al.* (2016) 'Green synthesis of nanoparticles and its potential application', *Biotechnology Letters*. Springer Netherlands, 38(4), pp. 545–560. doi: 10.1007/s10529-015-2026-7.
8) Mohamad, N. A. N. *et al.* (2014) 'Plant extract as reducing agent in synthesis of metallic nanoparticles: A review', *Advanced Materials Research*, 832, pp. 350–355. doi: 10.4028/www.scientific.net/AMR.832.350.
9) Stoimenov , p . k . (2002) . Metal oxid nanoparticles as bactericidal agent Iangmuir .18 : 79-86.
10) Verbruggen, N. and Hermans, C. (2013) 'Physiological and molecular responses to magnesium nutritional imbalance in plants', *Plant and Soil*, 368(1–2), pp. 87–99.
11) Cai, L. *et al.* (2018) 'MgoNPs can boost plant growth: Evidence from increased seedling growth, morpho-physiological activities, and Mg uptake in Tobacco (*Nicotiana tabacum L.)*', *Molecules*, 23(12), pp. 1–15.
12) Farhat, N., Elkhouni, A., Zorrig, W. *et al.* Effects of magnesium deficiency on photosynthesis and carbohydrate partitioning. *Acta Physiol Plant* **38,** 145 (2016).
13) Lowry, O. H., Rosebrough, N. J., Farr, A. L., & Randall, R. J. (1951) ' Protein measurement with the Folin phenol reagent', Journal of biological chemistry, 193, pp.265-275.
14) Schonfeld, M. A., Johnson, R. C., Carver, B. F., & Mornhinweg, D. W. (1988) 'Water relations in winter wheat as drought resistance indicators ', Crop Science, 28(3), pp.526-531
15) Ali, Z. H. and Ali, F. H. (2019) 'Effect of Salicylic Acid on Chlorophyll A , B and Carotene Content of Petunia sp .', *Indian Journal of Ecology*, 46 Special((8):), pp. 188–191.
16) Al Wahbi, M. H., and Bassallah, M. O. (2003) analysis Plant tissue Practica
17) Alradi, F. H., & Atia, E. A. (2020). Biosynthesis of agnps using leaves extract for eichhornia crassipes plant and their activity on staphylococcus aures growth zone. *Annals of Tropical Medicine and Health*, *23*, 23-1034.
18) Cakmak I (2005) The role of potassium in alleviating detrimental effects ofabiotic stresses in plants. *Journal of Plant Nutrition and Soil Science* **168**, 521–530. doi:10.1002/jpln.200420485
19) Ramadan, A. A. E. M. *et al.* (2020) 'Growth, yield and biochemical changes of soybean plant in response to iron and magnesium oxide nanoparticles', *Pakistan Journal of Biological Sciences*, 23(3), pp. 406–417. doi: 10.3923/pjbs.2020.406.417.
20) Mageshwari K., Sathyamoorthy R., Preparation and characterization of MgO nanoflakes by wet precipitation method, *Proceedings of National Conference on Developing Scenario in Applied Sciences and Communicative English*, 2012, p. 56-58.
21) Tamilselvi P., Yelilarasi A., Hema M., Anbarasan R., Synthesis of hierarchical

Annals of R.S.C.B., ISSN:1583-6258, Vol. 25, Issue 6, 2021, Pages. 5129 - 5136
Received 25 April 2021; Accepted 08 May 2021.

structured MgO by sol-gel method, *Nano Bulletin*, 2013, Vol. 2, No.1.

22) Dhal J. P., Sethi M., Mishra B. G., Hota G., MgO nanomaterials with different morphologies and their sorption capacity for removal of toxic dyes, *Materials Letters* 141 (2015) 267–271.
23) Ali, R. *et al.* (2020) 'Green synthesis and the study of some physical properties of MgO nanoparticles and their antibacterial activity', *Iraqi Journal of Science*, 61(2), pp. 266–276. doi: 10.24996/ijs.2020.61.2.9.
24) Bdewi, S. F., Abdullah, O. G., Aziz, B. K., & Mutar, A. A. (2016). Synthesis, structural and optical characterization of MgO nanocrystalline embedded in PVA matrix. Journal of Inorganic and Organometallic Polymers and Materials, 26(2), 326-334.
25) Bdewi, S. F., Abdulrazaka, A. M., & Aziz, B. K. (2015). Catalytic Photodegradation of Methyl orange using MgO nanoparticles prepared by molten salt method. Asian Trans Eng, 5, 1-5.