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Effect of Fibers Length on Concrete Properties Focus on polypropylene fibers

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Abstract
Concrete has been reinforced with various natural and synthetic fibers since ancient times to improve its chemical, physical and mechanical properties. Among these fibers are polypropylene fibers, which possess numerous advantages, such as improved tensile and flexural strength due to their high elasticity, as well as increased durability and high resistance to chemical corrosion. The quantity and length of fibers play a crucial role in enhancing concrete properties. This research investigates the effect of adding 12, 18 and 30mm long polypropylene fibers at a constant ration of 0.5% of the cement weight to concrete. Compressive, flexural and tensile strength tests were performed, in addition to slump test for fibers-containing concrete samples, and the results were compared to a control mix. The results showed that the workability of the concrete decreased with increasing fiber length. Compressive strength was not significantly affected by fiber length, while flexural and tensile strength are increased with added fibers and increased with fiber length increased by a significant percentage of 30% and 7% respectively when 30mm long polypropylene fibers were added.
Keywords: Concrete, Mechanical and Physical properties, Polypropylene.

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تأثير طول الألياف المضافة على خواص الخرسانة: تركيز على ألياف البولي بروبلين

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الملخص

أستخدم العديد من الألياف الطبيعية والصناعية منذ زمن بعيد لتحسين خواص الخرسانة، من بين هذه الألياف المستخدمة ألياف البولي بروبلين لما تتمتع به من مميزات مثل رخص ثمنها ومرونتها العالية التي تساعد على تحسين قوة الانحناء والشد للخرسانة بالإضافة إلى مقاومة هذه الألياف العالية لتأكل والظروف الكيميائية الصعبة. نوع وكمية الألياف المضافة وكذلك طولها تلعب الدور الأساسي في تحسين خواص الخرسانة. في هذا البحث تمت دراسة تأثير إضافة ألياف البولي بروبلين إلى الخرسانة عند أطوال مختلفة 12، 18، 30 مم بنسبة وزنيه 0.5% من وزن الاسمنت. أجريت اختبارات، مقاومة الضغط ومقاومة الانحناء والشد الانشطاري بالإضافة إلى اختبار التشغيلية على جميع العينات وقورنت النتائج مع الخرسانة المرجع (بدون ألياف). وجد أن إضافة الألياف قد قللت من تشغيلية الخرسانة عند جميع الأطوال المضافة. تحسنت كلا من مقاومة الانحناء ومقاومة الشد الانشطاري بشكل ملحوظ وزادت كلا منهما مع زيادة طول الألياف بنسبة 30% في مقاومة الانحناء و7% في مقاومة الشد الانشطاري عند إضافة الألياف بطول 30 مم. لم تتحسن مقاومة الضغط لجميع العينات التي تحتوي على ألياف، في حين عملت الألياف على تكوين جسور داخل شقوق الخرسانة ومنعتها من الانهيار ما ساعد على بقاء الخرسانة متماسكة بعد الكسر في حين تفتتت العينة التي بدون ألياف بعد الكسر إلى أجزاء.

الكلمات المفتاحية: خرسانة، ألياف، بولي بروبلين، مقاومة ضغط، انحناء، شد، تشغيلية.

Effect of Fibers Length on Concrete Properties
Focus on polypropylene fibers

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1. Introduction

Concrete is one of the most widely used building materials in the world due to the availability of its components, its ease of shaping, and its high compressive strength. However, conventional concrete suffers from poor tensile and flexural strength and is susceptible to cracking due to varying loads or shrinkage during hardening, which can negatively affect its long-term performance and durability. To overcome these problems, researchers have turned to using various fibers as reinforcing materials within concrete mixes to improve their mechanical, chemical and physical properties. Polypropylene fibers are among the most commonly used fibers due to their low cost, high resistance to chemical corrosion, and ease distribution within the concrete mix. Polypropylene fibers reduce the spread of micro-cracks within concrete and improve the cohesion of its components, leading to increased tensile, flexural and impact resistance, as well as enhanced durability and reduced dry shrinkage cracking. These fibers also contribute to improving concrete behavior under dynamic loads and increase its energy absorption capacity (Bagherzadeh et al; 2012), (Latifi, et al; 2022).

Given the importance of these advantages, many studies have focused on evaluating the effect of fiber addition ratios and different fiber lengths on the mechanical properties of concrete, with the aim of determining the optimal ratio and lengths that achieve the best performance without negatively affecting the workability or homogeneity of the concrete mix.

2. Literature review

Many studies have found that the length of polypropylene fiber effects the properties significantly, one of them (Najimi et al; 2009). In their study they used different fiber lengths (6,12, 19mm) and they investigated the effect of fiber ratio and length on the compressive, flexural, tensile strength, as well as water absorption and density of concrete. The results of the study revealed that the flexural and tensile strength increased within fiber length increased because the long fiber acts as bridges inside cracks. In a similar study to (Pietrzak, 2024), which used the same fiber lengths and obtained almost identical results. Both studies concluded that longer fibers can bridge the cracks better than other fibers. In addition, a

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similar study used the same fiber length (Pietrzak, & Ulewicz, 2019) the study focused on compressive strength, but the results showed that there was not any improvement in the compressive strength at study lengths as well as flexural strength.

Other studies have tested fibers up to 50mm in length (10, 20, 30, 40, 50mm) (Juraeva et al; 2025) the study found that the best results were obtained at length ranging from 10-20mm and the compressive strength increased with fiber length increased up to 30mm by 15.9%. while longer fibers, such as 50mm, yielded less results due to fiber entanglement, which caused voids within the concrete.

The length and surface characteristics of fiber also impact the concrete properties (Georgiou, & Pantazopoulou, 2016) they used fibers within lengths of 13, 25, 35mm. The study found that the long fibers with a rough or curved surface give the best results for flexural and tensile strength, but it impacts negatively on the workability of concrete, the study also revealed that short fibers positively affected compressive strength, while longer fibers had a negative effect. Conversely, flexural strength improved with increasing fiber length. As well as similar studies with similar results was observed by (Memon, 2018) within fibers lengths 12.7, 25.4mm at 0.2%, 0.25% and 0.3% content by weight. In general, most studies have confirmed that the mechanical properties of concrete improved with increasing fiber length up to a certain length, and most studies have confirmed that the most lengths used in literature for polypropylene fibers were (6-50mm) (Ahmed et al; 2020), (Ahmad et al; 2022).

Nemours studies have been focused on the effect of quantity and quality of fibers on the concrete properties, but few of them focus on the impact of fibers length. This study was to investigate the effect of polypropylene fibers length (12, 18, 30mm) on concrete properties and their importance during and after crack.

3. Materials and methodology

3.1. Materials

3.1.1. Cement

The cement used in the research is cement produced by the Arab Union Contracting Company, manufactured at the AL-Burj Zliten

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factory and symbolized by the symbol CEM II-4-1 A-L 42.5 N, the chemical, physical and mechanical properties of the cement are listed in tables 1,2 and 3.

Table 1. The main oxide components (%) of cement (Abu Darbala et al 2022).

Chemical element	SiO_2	Al_2O_3	CaO	Fe_2O_3	MgO
Composition	19.5	5.41	64.04	2.76	2.82
Chemical element	SO_3	L.O.i	CaOF	Na_2O	TiO_2
Composition	1.80	0.38	0.82	0.25	8.94

Table 2. Mineral composition of (%) of clinker (Abu Darbala et al2022).

C_2S	C_3S	C_3A	C_4AF
21.21	63.43	14.13	21.11

Table 3. Physical and mechanical properties of cement (Mohammed et al 2021).

Testing	Results	Libyan specification limits No. 430 of 1997	BS12:1996
Initial setting time (min)	218	> 45 min	> 45 min
Final setting time (min)	250	< 10h	< 10h
Fineness	3201	> 2500	> 2500
Expansion (mm)	0.90	< 10mm	< 10mm
Compression strength at 3 days (MPa)	37.20	> 21	> 21
Compression strength at 28 day (MPa)	58.33	> 39	> 39

3.1.2. Natural fine aggregate (sand)

The natural sand as known sand of Zliten was used; it is the best type of sand locally.

3.1.3. Crushed coarse aggregate.

The crushed coarse aggregate which was used in this research was 1.5cm in size.

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3.1.4. Water.

Potable water was employed for mixing concrete mixes with PH = 7.5

3.1.5. Polypropylene fiber.

Monofilament polypropylene fibers of different lengths have been used in this study with properties as in Table 4.

Table 4. Properties of polypropylene fibers used in study (isomat. (2025). Technical Datasheet .https://www.isomat.eu).

Color	White
Diameter	25(±10%) µm
Length	(12, 18, 30) mm
Density	0.91g/cm^3
Melting Point	(160-170) C^0
Ignition Point	570 C^0
Number of fibers per Kg	120×10^6
Modulus of Elasticity	1.6GPa
Tensile Strength	400(±10%) N/mm^2
Tensile Elongation	25(±10%)

3.2. Methodology

This study used an experimental approach to investigate the effect of adding different lengths of polypropylene fibers on the physical and mechanical properties of concrete. All concrete mixes were designed according to approved standard specification's and mixed in a ratio of 1:2:3, cement: soft aggregate: crushed aggregate at a constant fiber ratio of 0.5% by weight of cement and a constant w/c ratio of 0.55. Four concrete mixes which were prepared in this research as in Table 5.

Table 5. Concrete mixes used in the study.

Type	Cement (Kg)	Fine aggregate (Kg)	Coarse aggregate (Kg)	Water Ratio (W/C)	PPF (Kg)
Mix1(control)	60	120	180	0.55	0.0
Mix 2	59.7	120	180	0.55	0.3(12mm)
Mix 3	59.7	120	180	0.55	0.3(18mm)
Mix 4	59.7	120	180	0.55	0.3(30mm)

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The dry constituents were first mixed until a homogeneous blend was obtained. Then fibers were added by hand while mixing continued to ensure their uniform distribution throughout the concrete matrix, after that we added water gradually.
Fresh concrete was cast into clean steel molds in layers, each layer was compacted using a tamping rod, followed by vibration on an electric vibrating table to remove entrapped air and achieve proper compaction. After casting into standard molds, the samples were treated in water for testing after 7 and 28 days.

4. Testing equipment

The workability of fresh concrete mixtures was evaluated using the slump test in accordance with ASTM C143/C143M, as in figure1.

Figure 1. Slump test equipment.

The compressive test was performed on cube specimens measuring 150×150×150 mm as in figure 2 after 7, 28days of curing. The test was conducted according to the relevant standard (BS EN 12390-3).

Figure 2. The compressive strength test machine.

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The flexural strength test was conducted on beam specimens measuring 150×150×600 mm as in figure 3 after 28 days of water curing according to the applicable standard ASTM C293/C293M using the center-point lading method.

Figure 3. The flexural strength test machine.

The splitting tensile strength tests were performed on the cylindrical specimens with dimensions of 150 mm in diameter and 300 mm in height as in figure 4 after 28 days accordance with ASTM C496/C496M. All tests were conducted inside the concrete laboratory at the High Institute of Science and Technology Az-Zawia by used machine manufacturing by **Wekob Maschinenbau GmbH Germany**.

Figure 4. The splitting tensile strength test machine.

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5. Results and discussion

5.1. Workability

workability of concrete is influenced by adding fibers for many reasons, such as fiber agglomeration which forms air voids and causes impaired movement of concrete, as well as the different properties between fibers and concrete components which lead to surface fraction, such these problems are observed in all fiber reinforced concrete (Dharan, & Lal, 2016). The type, quantity, and length of fibers, along with the w/c ratio and several other factors, affect the workability of concrete (Karahan, & Atiş, 2011).

The results of this study show the slump test values as in figure 5. All concrete mixes containing polypropylene fibers exhibited lower slump values than the control mix. A decrease in slump values was observed with increasing fiber length. The slump test value for mix2 with polypropylene fibers 12mm was 8cm, while the slump value for mix1 was 10cm. This indicates that adding fibers, even short ones, to the concrete mix causes an impediment to the movement of the concrete.

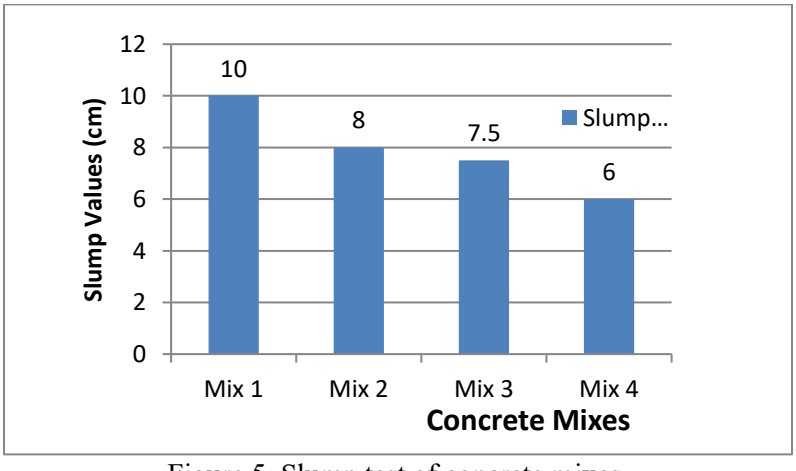

Figure 5. Slump test of concrete mixes.

This result was observed by (Mehdipour et al; 2013). where polypropylene fibers of lengths (6-12) mm were used at different volumetric ratios and at different w/c ratios as well. It was observed that workability decreased when fibers were added, and this

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decrease increased with the increase in fiber length and fiber ratio in the concrete, this decrease in workability was interpreted as resulting from friction between the fibers and the concrete components, which generated internal resistance that hindered the flow of the concrete.

Mix2 with polypropylene fibers 12mm showed a slump value of 8cm, slightly less than mix1. A similar result was observed by (Kafri, & Alsadaai, 2022). at a w/c ratio of 0.53, despite the addition of a plasticizer in their research.

For mix4 with polypropylene fibers 30mm, the lowest slump value among all studied mixes was observed at 6cm. This is attributed to the increased surface contact area between the fibers and the concrete components as the fiber length increases. This decrease in slump values with increasing fiber length is consistent with the findings of the (Najimi, et al; 2009), where fibers of 6, 12, and 19mm lengths. The workability of concrete decreased when fibers were added to it, and this decrease increased with increasing fiber length, (Li, et al; 2018) also confirmed this result. As well, this was observed in several studies collected by (Ahmad, et al; 2022) in its literature survey, which aimed to collect studies that focused on the effect of the ratio and length of polypropylene fibers on the workability of concrete. The lengths in the studied research ranged from 6-50 mm at different mixing ratios, and workability decreased with increasing fiber length in all studies.

5.2. Compressive strength

Compression tests were carried out on all samples of concrete mixes after 7 and 28 days, and the results were compared to the control mix and the results of the compression test were also compared among themselves as shown in the figure 6. From the results, we note that when polypropylene fibers were added, the compressive strength of the concrete mixes decreased compared to the control mix, this decrease in compressive strength of mixtures containing polypropylene fibers was observed in our previous study (Elhag, et al; 2025)**.** The compressive strength improved with increasing fiber length, but it remained lower than the control mix for all mixes. Figure 6 shows that the compressing strength of mix2 was 27MPa when 12mm polypropylene fibers were added compared with mix1,

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the compressive strength decreased by 18.5%, improved in mix3 with the addition of 18 mm fibers 28MPa, and then decreased again in mix4 with longer fibers 30 mm, but all remained below the compressive strength of the control mix, these results were observed by (Memon, 2018).

This effect of fiber length on compressive strength has been observed in other studies (Najimi, et al; 2009), which confirmed that adding polypropylene fibers (6, 12, 19mm) to concrete mixes did not improve compressing strength, but the decrease in compressive strength improved with increasing fiber length. This increase occurs at a certain percentage and length of fibers, after which the compressing strength values begin to decrease. The compressive strength of concrete depends on many factors, such as the fiber type, its ratio and length, as well as the method of mixing the concrete. A study by (Tassew, & Lubell, 2014). showed that the use of fibers with volumetric ratios ranging from 0-2% with different lengths did not significantly affect the compressing strength.

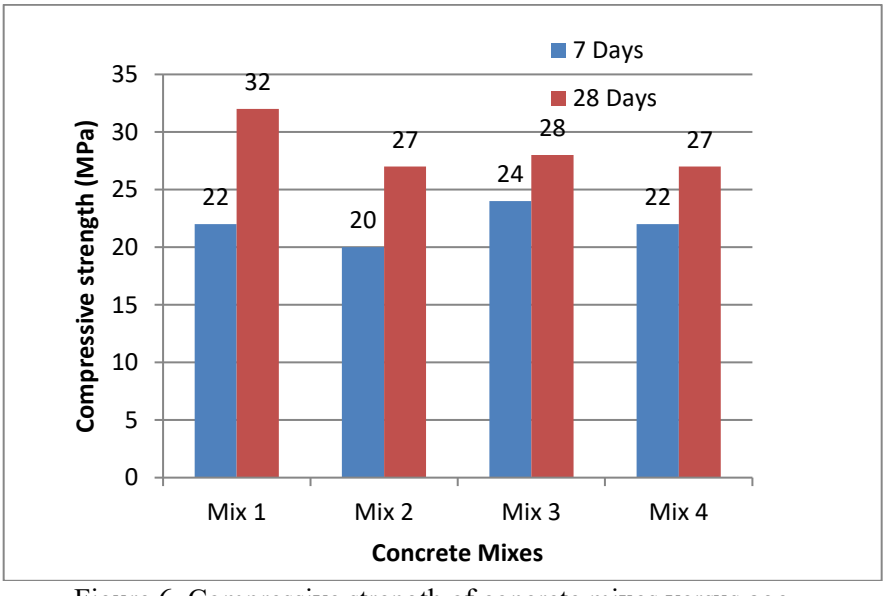

Figure 6. Compressive strength of concrete mixes versus age.

The results obtained in this study show that the optimal compressive strength for the fiber-enriched mixes was achieved at a length of 18

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mm. This improvement in compressive strength with increasing fiber length can be observed in other studies (Juraeva et al; 2025) that used polypropylene fibers at lengths ranging from 10-50 mm, where compressive strength improved up to a length of 30 mm and then began to decrease with longer fibers, (Li, et al; 2018) also confirmed this result. In contrast, other studies (Shen, et al; 2020) revealed that the compressive strength increased with increase of fiber length by 2% and 3.3% when the length of polypropylene fiber increased from 42mm to 60mm.

In general, most studies (Cifuentes, et al; 2013) confirmed that polypropylene fibers, by their very nature hydrophobic, lead to a general weakness in the concrete matrix, which leads to a failure pattern that causes the fibers to separate under medium and large loads. Therefore, they did not contribute significantly to improving compressive strength, and increasing the fiber content and length reduces compressive strength, which is what was observed here in this study.

It is worth noting here that the samples reinforced with polypropylene fibers remained intact after breaking and did not collapse as shown in figure 7, while the reference sample without fibers disintegrated into pieces. This indicates that the fibers act like bridges within the cracks, binding the concrete pieces together and preventing them from crumbling.

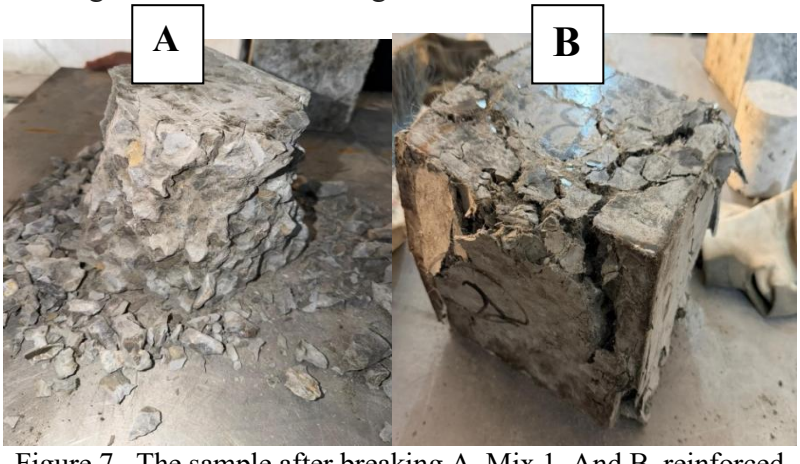

Figure 7. The sample after breaking A. Mix 1. And B. reinforced sample.

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5.3. flexural strength

From the results of flexural strength test as in figure 8. Added fiber at 12mm to concrete improves the flexural strength by 17.5% compared with control mix1 this improved in flexural strength has obtained when polypropylene fiber were added to the concrete which observed also by (Bei-Xing, et al; 2004), as well as we can see that the flexural strength increases with the increase of fiber length from 12 to 18mm and from 18 to 30mm by 6.4% and 4% respectively. This gradual increase with increasing fiber length has been observed in other studies (Özsoy Özbay, et al; 2021), (Najimi, et al; 2009), (Memon, 2018).

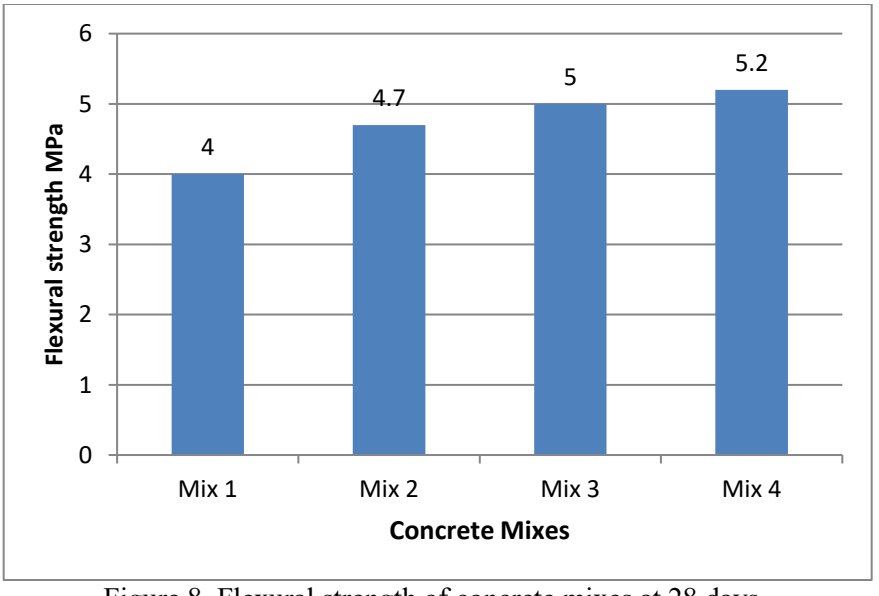

Figure 8. Flexural strength of concrete mixes at 28 days.

From the figure 8, we can see a direct relationship between the increase in flexural strength and the increase in fiber length. The mix4 with fiber long 30mm showed the best results of flexural strength with 5.2MPa compared with other mixes this result was obtained by (Köroğlu, & Özdöner, 2016). when a 33mm pp fiber has added and (Özsoy et al; 2021) confirm this result as well, as the fiber acted like bridges within the cracks as shown in figure 9, and prevented the concrete from separating.

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Figure 9. Reinforced mixes during flexural test.

5.4. Tensile strength

The splitting tensile strength results showed that polypropylene fibers did not significantly improve splitting tensile strength, despite their high elasticity, good resistance to shrinkage cracking, and light weight which allows for good distribution within the concrete matrix. Their tensile strength is relatively weak. Its role lies more in improving toughness, micro-cracking resistance, and flexural strength than in increasing actual strength. Consequently, its resistance to splitting tensile strength is limited, and in some cases, it can even negatively affect tensile strength. As shown in figure 10, the results of this study indicate that the tensile strength of concrete reinforced with polypropylene fibers improved by 5.2%.

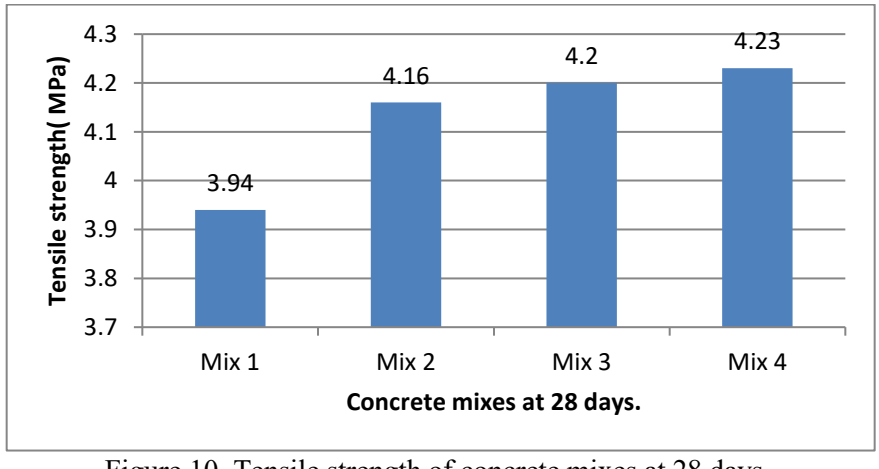

Figure 10. Tensile strength of concrete mixes at 28 days.

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6. Conclusion

This study investigated the effect of fibers length on the properties of concrete, from the results obtained from this study, we can conclude that adding polypropylene fiber to concrete with 0.5% ratio and length of 12-30mm effects the workability of concrete and this effect increases with increased of fiber length. The workability of concrete is negatively affected by the addition of polypropylene fibers due to their uneven distribution within the concrete matrix, which results in the clumping of these fibers and an increase in air voids, which in turn impedes movement. Compressive strength is also affected by added fiber, which decreased with increased fiber length. In contrast, the flexural strength increased by adding fiber and this increase coincided with an increase in fiber length. Polypropylene fibers increase the strength of the concrete and their distribution through cracks helps protect the concrete from collapse. Based on the results of this study, it can be said that by controlling the quantity and length of the polypropylene fibers, the properties of concrete can be improved and the best results obtained.

7. Recommendations

From the study results, we can recommend:

1- To maintain the proper workability of fiber concrete, plasticizer must be added.

2- Fiber type, length and content play a main role in improving the concrete properties, so the adjusting of these parameters is the key to improving concrete properties.

3- More studies of polypropylene fibers with different lengths and geometry are needed.

4- Microscopic investigation about the mechanism of fibers inside concrete to understand how fibers work.

5- Studying longer lengths of polypropylene fibers to determine the effect of longer lengths.

8. References

Abu Darbala. N M, Al-Naqassa. A A, Al-Hamali. A M, Rashid. M A, 2022, A study to evaluate the chemical composition of some

http://www.doi.org/10.62341/istj-vol39-1-rg12

types of cement available in the Libyan market, International Science and Technology Journal. 92, 1-16.

Ahmad. J, Burduhos-Nergis. D, Arbili. M, Alogla. S. M, Majdi. A, & Deifalla. A. F, 2022, A review on failure modes and cracking behaviors of polypropylene fibers reinforced concrete, Buildings. 12, 1951.

Ahmed. T W, Aljubory. N. H, & Zidan. R. S, 2020, Properties and performance of polypropylene fiber reinforced concrete: A review, Tikrit Journal of Engineering Sciences. 27, 82-97.

Bagherzadeh. R, Sadeghi. A. H, & Latifi. M, 2012, Utilizing polypropylene fibers to improve physical and mechanical properties of concrete, Textile research journal. 82, 88-96.

Bei-Xing. L. I, Ming-xiang. C, Fang. C, & Lu-ping. L, 2004, The mechanical properties of polypropylene fiber reinforced concrete, Journal of Wuhan University of Technology-Mater. Sci. Ed. 19, 68-71.

Cifuentes. H, García. F, Maeso. O, & Medina. F, 2013, Influence of the properties of polypropylene fibers on the fracture behaviour of low- normal-and high-strength FRC, Construction and Building Materials. 45, 130-137.

Dharan. D. S, & Lal. A, 2016, Study the effect of polypropylene fiber in concrete, International Research Journal of Engineering and Technology. 3, 616-619.

Elhag. R, Elfarah. T, Alareefi. S, Alrjaibi. A, & Tweib. S, 2025, Study the effect of glass fibers and polypropylene fibers on the mechanical properties of concrete, Scientific Journal for Publishing in Health Research and Technology. 1, 54-64.

Georgiou. A. V, & Pantazopoulou. S. J, 2016, Effect of fiber length and surface characteristics on the mechanical properties of cementitious composites, Construction and Building Materials. 125, 1216-1228.

Juraeva. A, Martazaev. A, Razzakov. S, & Akmaljon. A, 2025, The effect of the quantity and length of fibers on the mechanical properties of fiber-reinforced concrete based on polypropylene fibers, Vibroengineering Procedia. 60, 571-578.

http://www.doi.org/10.62341/istj-vol39-1-rg12

Kafri. G. M. A, & Alsadaai. A. M, 2022, The Effect of Polypropylene Fiber on the properties of fresh and hardened self-compacting concrete (SCC), Sirte University Scientific Journal. 12, 103-116.

Karahan. O, & Atiş. C. D, 2011, The durability properties of polypropylene fiber reinforced fly ash concrete, Materials & Design. 32, 1044-1049.

Köroğlu. M. A, & Özdöner. N, 2016, Behavioural study of steel fiber and polypropylene fiber reinforced concrete, Key Engineering Materials. 708, 59-63.

Latifi. M. R, Biricik. Ö, & Mardani Aghabaglou. A, 2022, Effect of the addition of polypropylene fiber on concrete properties, Journal of Adhesion Science and Technology. 36, 345-369.

Li. L. G, Chu. S. H, Zeng. K. L, Zhu. J, & Kwan. A. K. H, 2018, Roles of water film thickness and fibre factor in workability of polypropylene fiber reinforced mortar, Cement and Concrete Composites. 93, 196-204.

Mehdipour. I, Vahdani. M, Libre. N. A, & Shekarchi. M, 2013, Relationship between workability and mechanical properties of fibre-reinforced self-consolidating mortar, Magazine of Concrete Research. 65, 1011-1022.

Memon. I. A, Jhatial. A. A, Sohu. S, Lakhiar. M. T, & Hussain. Z, 2018, Influence of fiber length on the behaviour of polypropylene fiber reinforced cement concrete, Civil Engineering Journal. 4, 2124-2131.

Mohammed. MS, Abaj. AF, Al-Faidi. MA, Al-Balaazi. HA, 2021, The effect of different sources of cement and coarse aggregate on the compressive strength of concrete manufactured from local materials, The third engineering conference of the Syndicate of Engineering Professions in Al-Zawiya.

Najimi. M, Farahani. F. M, & Pourkhorshidi. A. R, 2009, Effects of polypropylene fibers on physical and mechanical properties of concretes, In Proceedings of the Third International Conference on Concrete and Development, Tehran, Iran (pp. 1073-1081).

Özsoy Özbay. A. E, Erkek. O, & Çeribaşı. S, 2021, The effect of polypropylene, steel, and macro synthetic fibers on mechanical

http://www.doi.org/10.62341/istj-vol39-1-rg12

behavior of cementitious composites, Revista de la Construcción. 20, 591-601.

Pietrzak. A, 2024, Effect of polypropylene fiber structure and length on selected properties of concrete, Budownictwo o Zoptymalizowanym Potencjale Energetycznym. 13, 78-88.

Pietrzak. A, & Ulewicz. M, 2019, The impact of the length of polypropylene fibers on selected properties of concrete, Acta Scientiarum Polonorum. Architectura. 18(2).

Shen. D, Liu. X, Zeng. X, Zhao. X, & Jiang. G, 2020, Effect of polypropylene plastic fibers length on cracking resistance of high-performance concrete at early age, Construction and Building Materials. 244, 117874.

Tassew. S. T, & Lubell. A. S, 2014, Mechanical properties of glass fiber reinforced ceramic concrete, Construction and Building Materials. 51, 215-224.

isomat. (2025). Technical Datasheet. https://www.isomat.eu