

A REVIEW ON BAMBOO REINFORCEMENT IN BEAM

Chetan Bhatiwal¹, Prof. U. R. Awari²

¹PG Student, Department of Civil Engineering, A.I.S.S.M.S C.O.E. Pune Maharashtra, India¹

²Associate Professor, Department of Civil Engineering, A.I.S.S.M.S C.O.E. Pune Maharashtra, India²

Abstract - Concrete is the man-made material in the world. Reinforced concrete is common building material in the world, reinforcement used in concrete is quite costly. There is a cheaper reinforcing material that can be used in concrete is bamboo. Bamboo is consider as reinforcing martial as a temporary structure and scaffolding. Bamboo as reinforcing martial to concrete is an investigation in structural engineering. Bamboo has a good water absorption capacity it may causes structural failure and reduce the mechanical properties.

Key Words: Bamboo Reinforcement, Tensile Strength, Water Absorption, Shape of Bamboo, Durability.

1. INTRODUCTION

As reinforced concrete is common building material, it is important to make the development of building construction, low cost material. For developing country steel is difficult to obtain because of expensive prices and for low cost housing and temporary structure.

Many researches around the world are began to explore the use of low-cost and low-energy substitute construction material as reinforcing material. Among the many possibility for such substitution, bamboo. Bamboo which is one of the material fastest growing plants, and it is great economical potential. It grows naturally in many parts around the world and easily available. Bamboo takes less energy to harvest and transport. Therefore, bamboo has low manufacturing costs compared with steel. Bamboo has a good tensile strength and light weight. Bamboo has a good water absorption capacity it may reduce the mechanical properties and causes the structural failure. There is need to control the water abortion of bamboo. There is need to use proper seasoning method to reduce the water absorption.

Bamboo is able to resist more tension than compression. The fire resistance is very good because of the high content of silicate acid. Bamboo durability heavily depends on the preservation treatment method. This preservation method includes smoking, heating, drying, coating and another method is chemical treatment.

2. ADVANTAGES OF BAMBOO-

- Bamboo has a good strength.
- Bamboo is a flexible.
- Bamboo has an earthquake resistance capacity.

- Bamboo is light weight.
- Bamboo is cost effective than steel.
- Bamboo is easily available.

3. DISADVANTAGE OF BAMBOO-

- Bamboo catch the fire quickly.
- Bamboo's strength depend on the age of bamboo. Strength goes decreases as the increase in age.
- Moisture content directly affect the strength of bamboo.
- Bamboo has less bonding with concrete.
- Bamboo has a less durable.
- Shape of bamboo.

4. LITERATURE SURVEY

Sanjeev Gill, Dr. Rajiv Kumar, bamboo can use as reinforcement. Bamboo is cheap substitute for steel because bamboo grows much faster and is renewable source after 5-6 years. Water absorption in bamboo is directly affect the strength of bamboo. Tensile strength of bamboo is good so it can be use as a reinforcement. The behavior of bamboo as a reinforcement is same as plain steel bar [1].

I. K. Khan, it is found that the tensile strength of bamboo is approximately one half of the mild steel. The tensile strength of bamboo is 132 N/mm² [2].

Pratish Kumar Singh, Aashish Jodhani, Abhay Pratap Singh, it is been found that bamboo in the vertical position is more durable than in horizontal. Bending of bamboo can be permanently bent if heat, either dry or applied the pressure. The type of coating will depend on the seasoning material is used. A brush coat or dip coat of emulsion is useful for treatment of bamboo. Bamboo reinforced concrete beam design is similar to steel reinforcing design [13].

Anurag Nayak, Arehant S Bajaj, Abhishek Jain, Apoorv Khandelwal, Hirdesh Tiwari, bamboo can replace the timber and other material in construction work. When seasoned bamboo is used as reinforcing material it should receive a waterproofing coating to reduce swelling when in contact with concrete. Without some type of coating bamboo will swell before the concrete has developed sufficient strength. Bamboo reinforcement technique is cheaper than steel reinforcement [8].

Dr. Ashok Kumar Gupta, Dr. Rajiv Ganguly, Ankit Singh Mehra, the density of bamboo is very low which makes it very light material. Water absorption capacity is increase as increase in node. Tensile stress increase as increases in number node [15].

Atul Agarwal, Bhardwaj Nanda, Damodar Maity, adhesive has excellent resistance to water, oil and many other solvent. It observe that bonding strength at the interface of the bamboo concrete composite is higher for adhesive [14].

Chandra Sabnani, Madhuwanti. Latkar, Utpal Sharma, use only bamboo showing a pronounced brown colour. This will ensure that plant is at least three year old to get good strength. In any case, only a thin coating should be applied. A thick coating will lubricant the surface and weaken the bond with the concrete [12].

Ajinkya Kaware, Prof. U. R. Awari, Prof. M. R. Wakchaure, bamboo weak at node, maximum failure occur at node of the bamboo. Bamboo is weak in bond stress hence it should be treat with epoxy coating to get bond stress. Bamboo is weak in shear so it cannot used as a shear reinforcement. Tensile strength of bamboo is good so it can be used as a reinforcement in R.C.C structure for low cost housing. The behavior of bamboo is same as the steel bar. Moisture of content of bamboo is varies according to topography [9].

5. CONCLUSIONS

1. Bamboo can use as a reinforcement in R.C.C. structure as a low cost housing or temporary structure.
2. Bamboo can attain the tensile strength up to 370 N/mm². It is lies between 120 N/mm² to 370 N/mm².
3. Bamboo has a good water absorption capacity, which reduce the mechanical properties of bamboo.
4. Water content of bamboo is between 50%-60% by weight.
5. To reduce the water absorption capacity of proper seasoning treatment should be require.
6. Seasoning of bamboo is good for bituminous paint, epoxy, and coal tar.
7. Bamboo has low bond stress with concrete. There need to apply epoxy to bond with concrete.
8. Epoxy should apply in a thin coat using brush, a thick apply lubricant the bamboo and reduce the bond stress.
9. The behavior of bamboo is same as steel bar, it can be used as reinforcement.
10. Bamboo reinforcement design is same as R.C.C. steel beam.
11. The density of is low so bamboo is light in weight.

REFERENCES

- [01] Sanjeev Gill and Rajiv Kumar (2016), "To experimental study and use of bamboo in civil structure as reinforced concrete", International Journal of Latest Research in Science and Technology, Vol. 5, pp 102-105.
- [02] I. K. Khan (2014), "Performance of bamboo reinforced concrete beam", International Journal of Science, Environment and Technology, Vol. 3, pp 836 - 840.
- [03] Jigar K. Sevalia and Nirav B. Siddhpura (2013), "Study on bamboo as reinforcement in cement concrete", International Journal of Engineering Research and Applications Vol. 3, pp 1181-1190
- [04] M. Usha Rani (2017), "Investigation on the flexural behavior of bamboo reinforced concrete beams", International Journal of Research in Science and Technology, Vol. 7, pp 9-24
- [05] Efe Ikponmwosa and Funso Falade (2014), "Flexural performance of bamboo-reinforced foamed aerated concrete beams", American Journal of Materials Science, pp 56-63
- [06] James Kariuki and Richard A. Shuaibu (2014), "Flexural strength of laminated bamboo beams", International Journal of Advances in Engineering & Technology. pp -1531-1538.
- [07] I. K. Khan (2014). "Bamboo sticks as a substitute of steel reinforcement in slab", International Journal of Engineering and Management Research, Vol. 4, pp 836-840
- [08] Anurag Nayak and Arehant S Bajaj (2013), "Replacement of steel by bamboo reinforcement", IOSR Journal of Mechanical and Civil Engineering, Vol. 8, PP 50-61.
- [09] Ajinkya Kaware and Prof. U. R. Awari (2013), "Review of bamboo as reinforcement material in concrete structure", International Journal of Innovative Research in Science, Engineering and Technology, Vol. 2. pp 2461-2464
- [10] Jigar K. Sevalia and Nirav B. Siddhpura (2013), "Performance evaluation of axially loaded element using bamboo as reinforcement", International Journal of Engineering and Advanced Technology, Vol. 2, pp 413-415
- [11] K. Ghavami (2003), "Bamboo functionally graded composite material", Asian Journal Of Civil Engineering (Building and Housing) Vol. 4, pp 281-288

- [12] Chandra Sabnani, Madhuwanti Latkar and Utpal Sharma (2013), "Can bamboo replace steel as reinforcement in concrete, for the key structural elements in a low cost house" International Journal of Chemical, Environmental & Biological Sciences ,Vol.-1, pp 257-262
- [13] Pritesh Kumar, Ashish Jodhani and Abhay Singh (2016), "Bamboo as construction material and bamboo reinforcement", International Journal of civil and structural engineering research, Vol.4 pp 312-323.
- [14] Atul Agarwal, Bharadwaj Nanda and Damodar Maity (2014), "Experimental investigation on chemically treated bamboo reinforced concrete beams and columns" construction and building material 71, pp 610-617.
- [15] Dr. Ashok Kumar Gupta, Dr. Rajiv Ganguly and Ankit singh Mehra (2015), "Bamboo as green alternative to steel for reinforced concrete elements of a low cost residential building", Electronic Journal of Geotechnical Engineering, Vol.20 pp 1523-1545.