

**AMELIORATING THE
EFFECTS OF
PHYTOCHEMICAL
SUBSTANCES ON THE
SETTING OF CEMENT WITH
RICE BRAN IN THE
PRODUCTION OF PARTICLE
BOARDS USING A NATURAL
ACCELERATOR**

INTRODUCTION

- **OBJECTIVES OF THE RESEARCH WORK**
 - ✓ To investigate the compatibility of rice bran with cement
 - ✓ To estimate the effects of cow horn as a natural replacement for chemical additives
 - ✓ Effects of phytochemicals on the compatibility of rice bran with cement

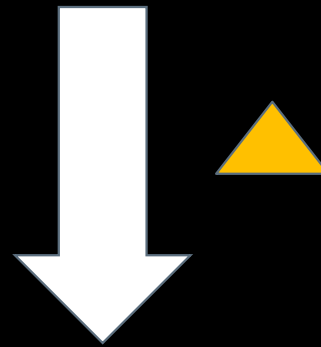


Rice bran-cement bonded particle boards

LIGNOCELLULOSIC MATERIAL + BINDER

(Discrete particle forms)

Pressure



PARTICLE BOARD

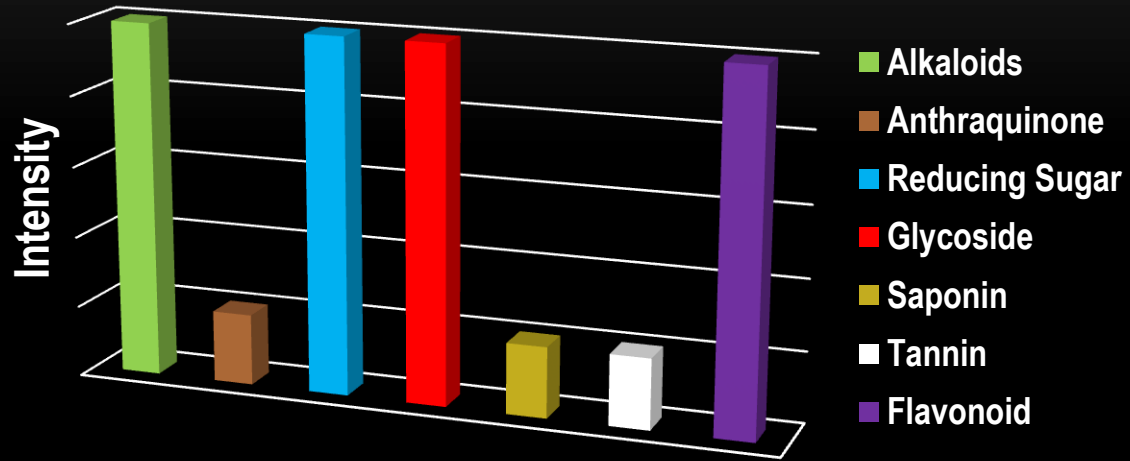
MATERIALS AND METHODS

- **Collection of samples**
- **Preparation of rice bran samples**
- **Preparation of cow horn samples**
- **Proximate analysis of samples**
- **Metal analysis**
- **Hot – water pretreatment of rice bran samples**
- **Phytochemical screening**
- **Compatibility test**
- **Hydration experiment for neat cement**
- **Hydration experiment for cement – sample mixture**
- **Addition of chemical additives**
- **Infra – red analysis**

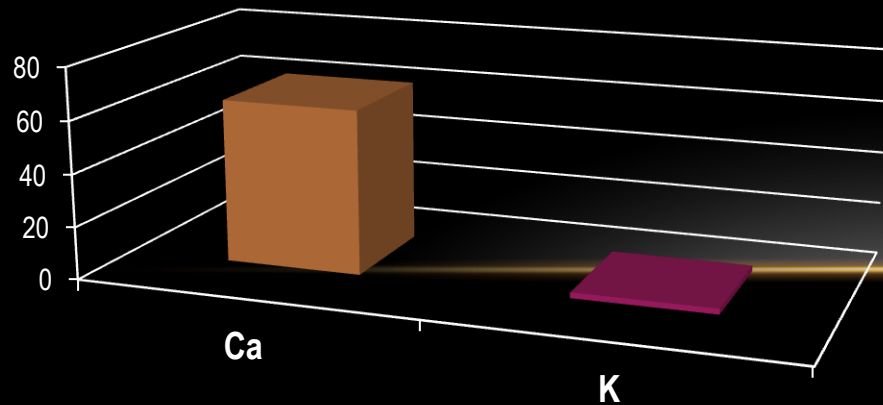
BINDER**SAMPLE NATURE****ADDITIVES USED****Cement****Cement (Powder)****0%****Untreated Rice bran****0%****2% CaCl₂, 3% CaCl₂****1%, 2% and 3% Cow horn****FeCl₃ : Cow horn(1:1, 2:1, 3:1)****SnCl₂, SnCl₄ : Cow horn(1:1, 2:1)****Untreated Rice Bran – Cow horn (15:10, 15:7.5, 7.5:7.5)****0%****Hot – water treated Rice bran****0%****2% CaCl₂, 3% CaCl₂****1%, 2% and 3% Cow horn****FeCl₃ : Cow horn(1:1, 2:1, 3:1)****SnCl₂, SnCl₄ : Cow horn(1:1, 2:1)****Hot treated Rice Bran – Cow horn (15:10, 15:7.5, 7.5:7.5)****0%**

RESULTS AND DISCUSSION

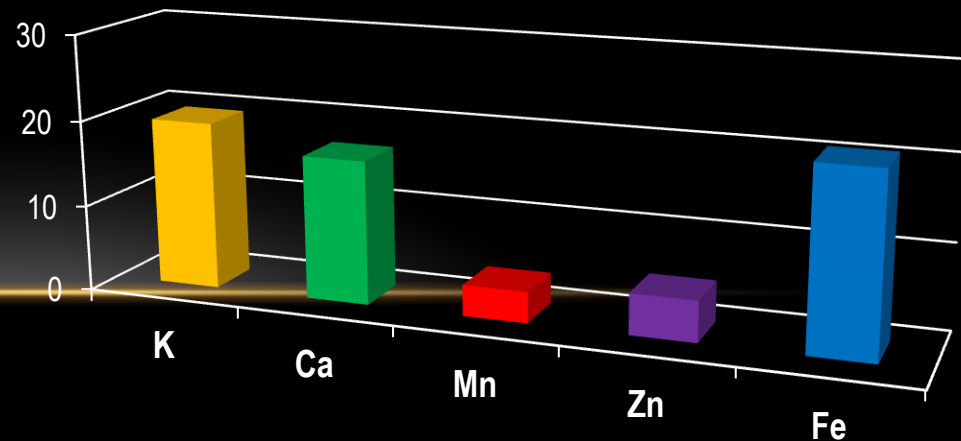
Intensities of various phytochemicals present in Rice bran



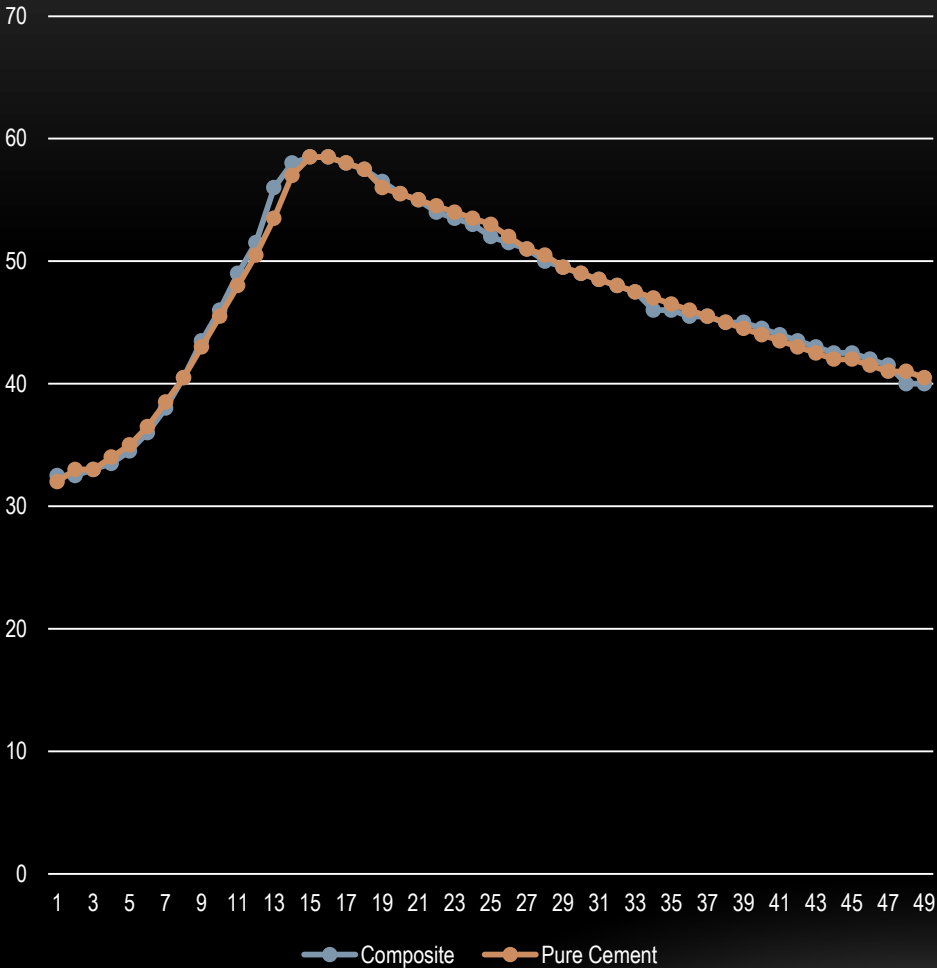
Metal contents in Cow horn (wt%)



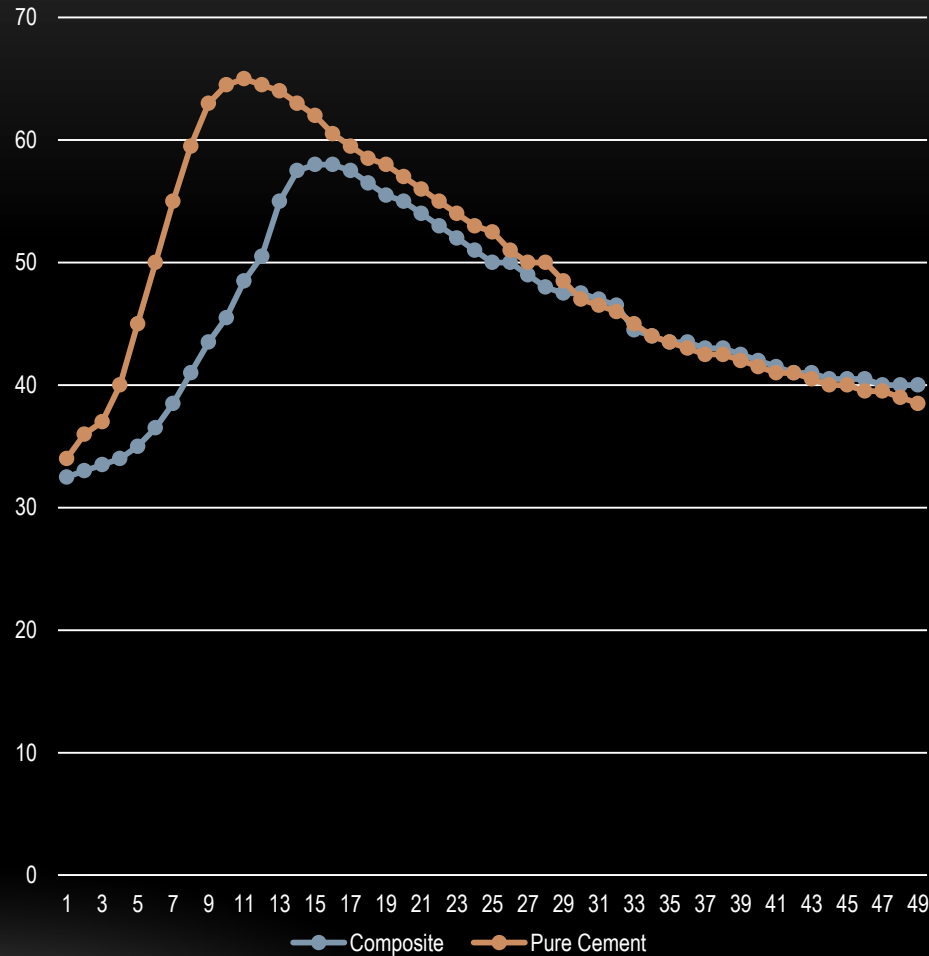
Metal contents in rice bran (wt%)



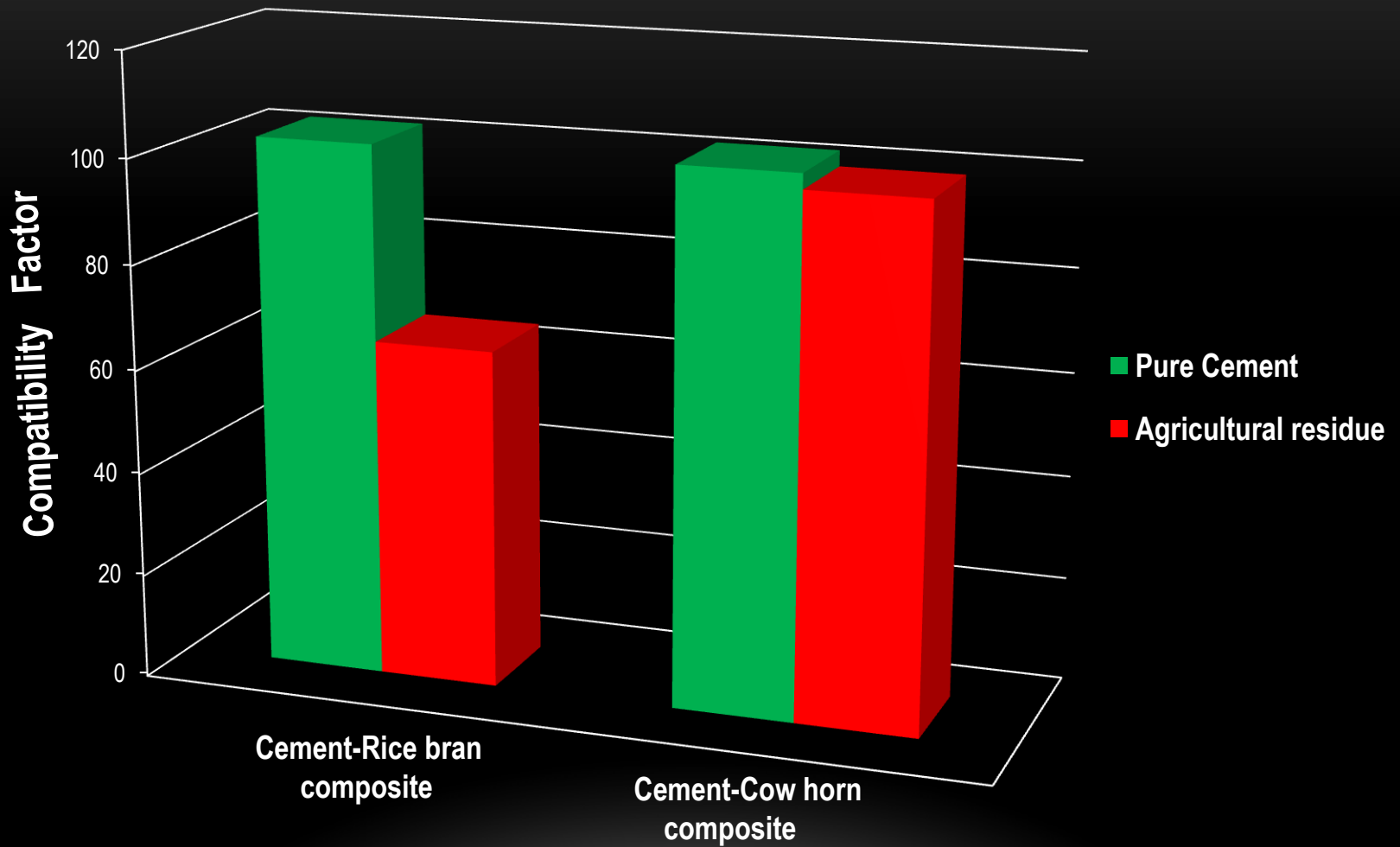
Compatibility Graph



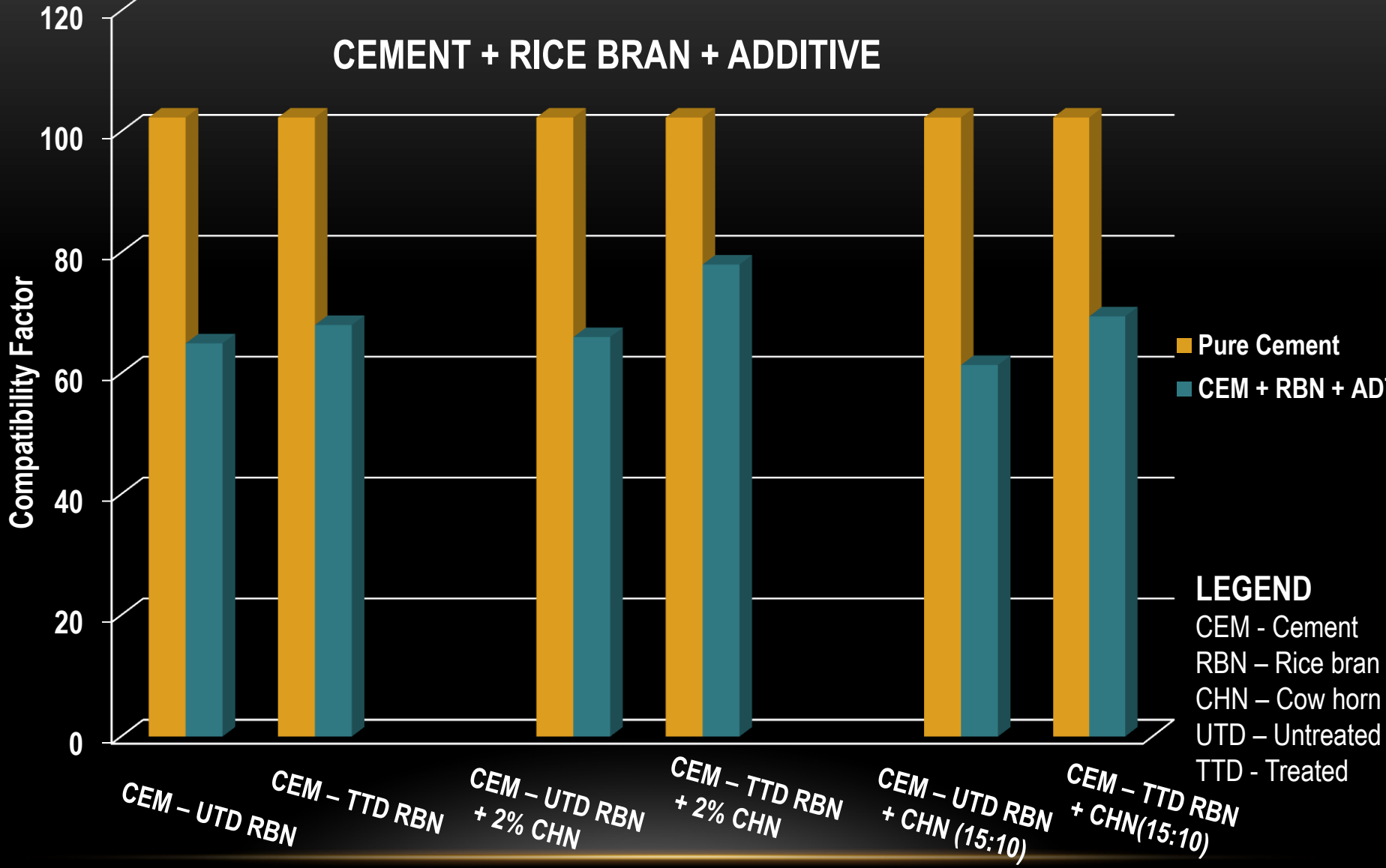
Compatibility Graph



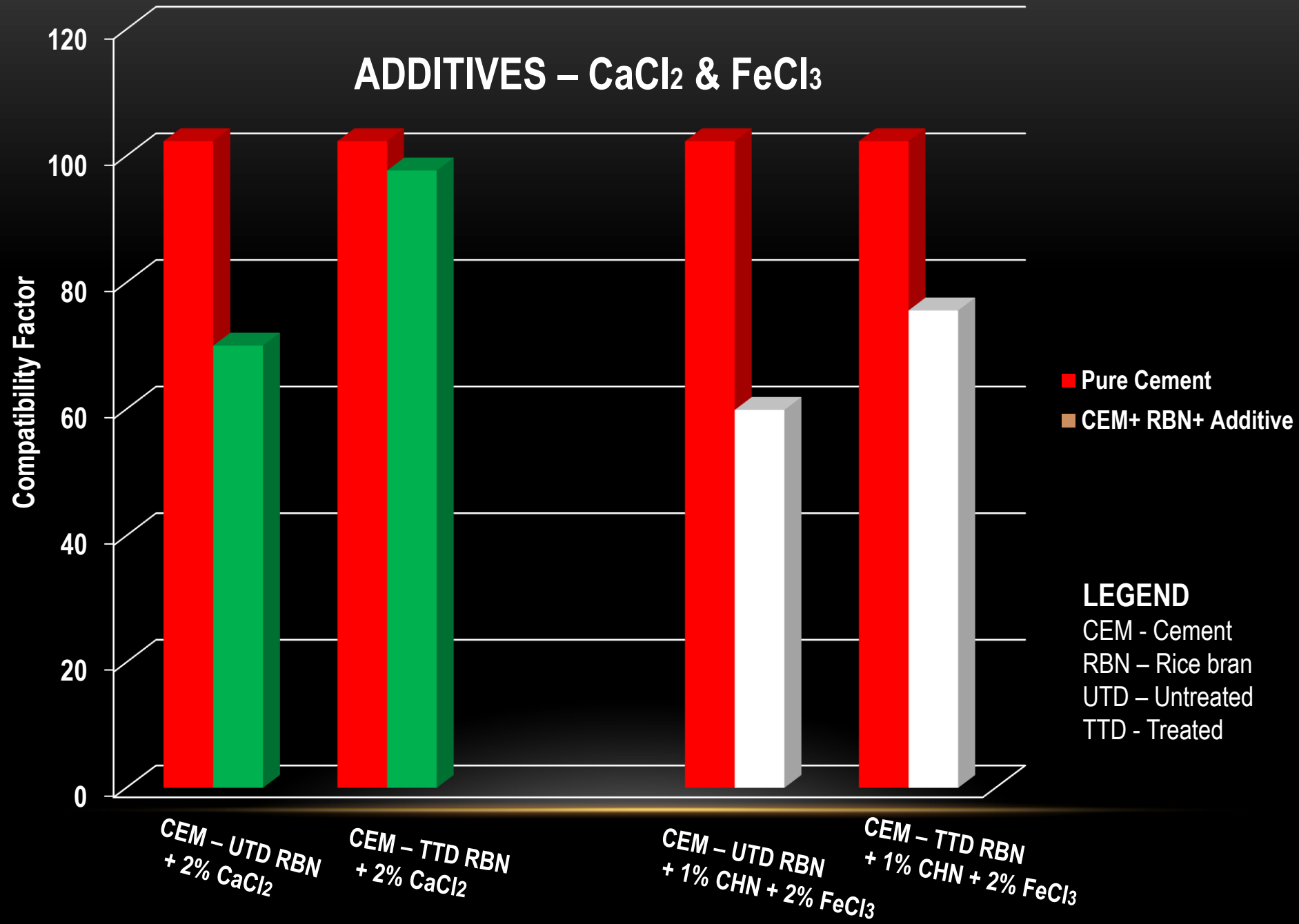
EXPLAINING COMPATIBILITY



CEMENT + RICE BRAN + ADDITIVE



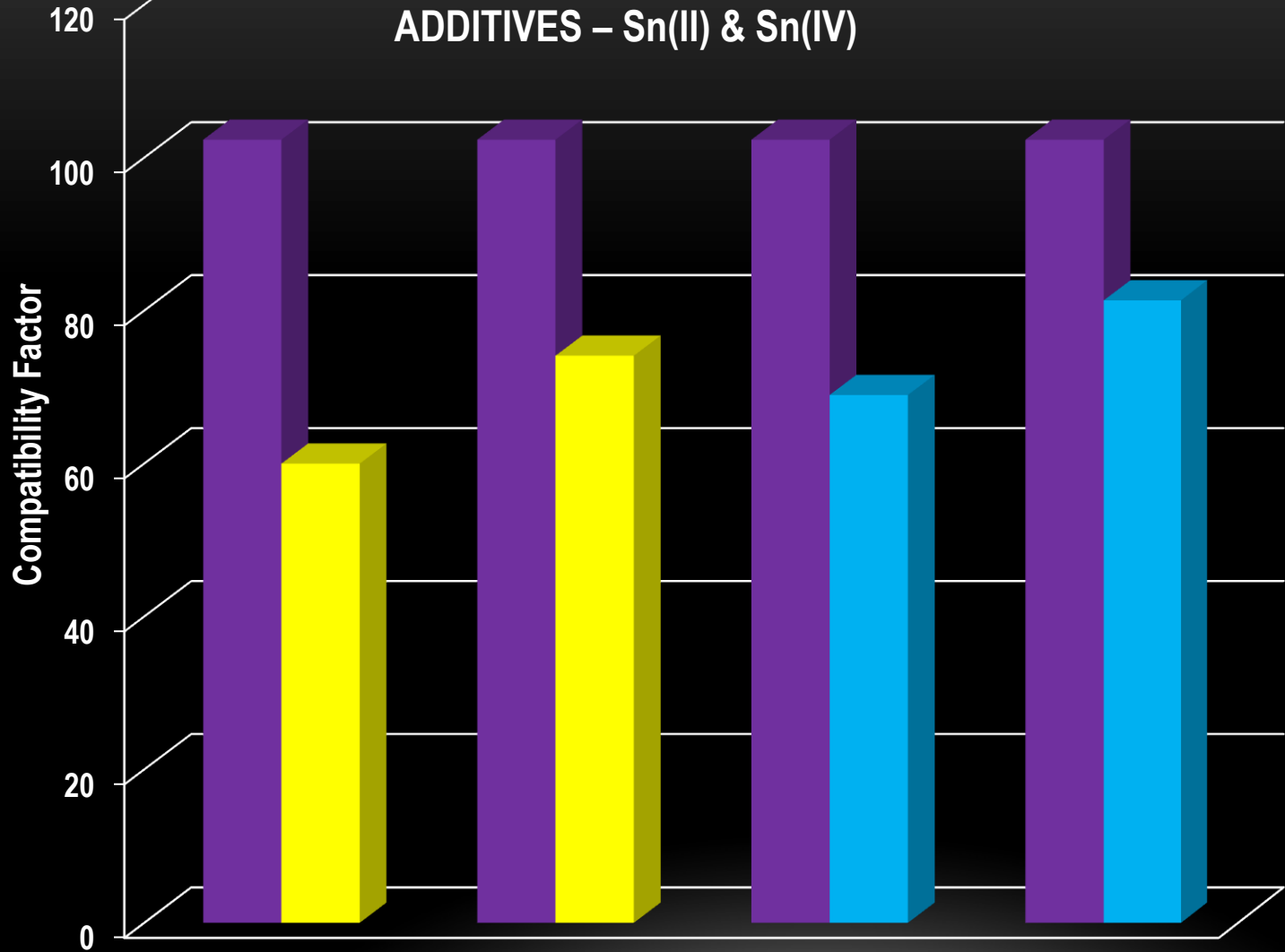
ADDITIVES – CaCl₂ & FeCl₃



- Pure Cement
- CEM+RBN+ Additive

LEGEND
CEM - Cement
RBN - Rice bran
UTD - Untreated
TTD - Treated

ADDITIVES – Sn(II) & Sn(IV)



- Pure Cement
- Cement + Rice bran + Additiv

LEGEND
CEM - Cement
RBN – Rice bran
UTD – Untreated
TTD - Treated

CEM – UTD RBN + 1% CHN + 2% SnCl₄
CEM – TTD RBN + 1% CHN + 2% SnCl₄
CEM – UTD RBN + 1% CHN + 2% SnCl₂
CEM – TTD RBN + 1% CHN + 2% SnCl₂

BONE	BONE-CEMENT		TREATED RICE BRAN-BONE (15:10)	UNTREATED RICE BRAN-BONE (15:7.5)		TENTATIVE ASSIGNED FUNCTIONAL GROUPS
3381.07vs (broad)	3448.59vs (broad)		3430.17m	3442.45vs (broad)		(O-H), (N-H) stretching
2932.99w						Saturated Sp ³ C-H
2368.28w 2128.90vw	2362.14w			2349.87w		
1656.50vs	1647.30w		1644.23w	1650.37m		(C=O), (C=C)
1451.02m	1435.68s		1447.95w	1429.55vs		Sp ³ C-H bending
1239.40m 1036.98s	1119.79vw 1012.45s		1119.79s 984.85s	1018.58vs		(C-O) ethers, esters
868.30w	880.57s		877.50w	874.44m 708.82vw		Aromatic (C-H) bending
	543.21s 460.40m		662.82m 555.48m 457.34w 383.73m	546.28vs 454.27vw		Rocking (CH ₂) groups

CONCLUSION AND RECOMMENDATION

- Cow horn is a good substitute for calcium chloride in ameliorating the effects of phytochemical substances in the setting of cement with rice bran.
- Despite the chelating property of Iron (III) chloride, it did not give the best result until after a 3% addition but Tin (II) chloride gave a better compatibility factor than Tin (IV) chloride.
- Evidence of bonds formation were observed through the O-H, C=O, C-O and non-aromatic methylene group but the O-H and C-O were the most prominent
- Reducing the usage of chemicals in cement bonded particle boards to reduce leaching
- Rice bran which serves as a source of fuel for cooking thereby releasing aromatics into the environment can be put into more economic and viable use such as the production of cement particle bonded boards which are environmentally friendly

THANK YOU