Strategies for maximizing utilization of de-oiled rice bran in fish feed

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An agro-industrial by-products which is obtained after oil is extracted.

- **Major ingredient of fish feeds in India.**
- **Used either singly or in combination with other ingredients.**

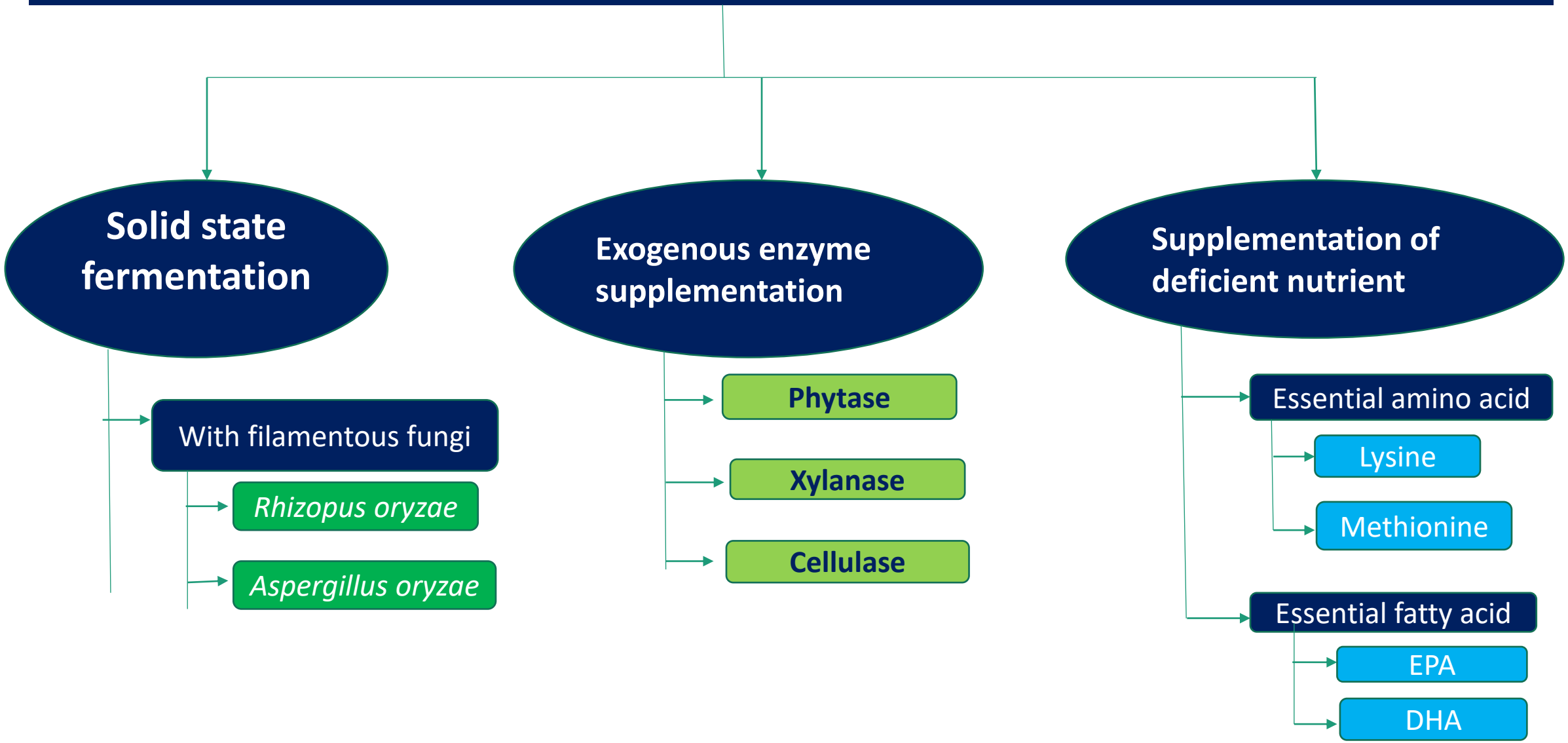
Constraints in utilizing DORB

High fiber content

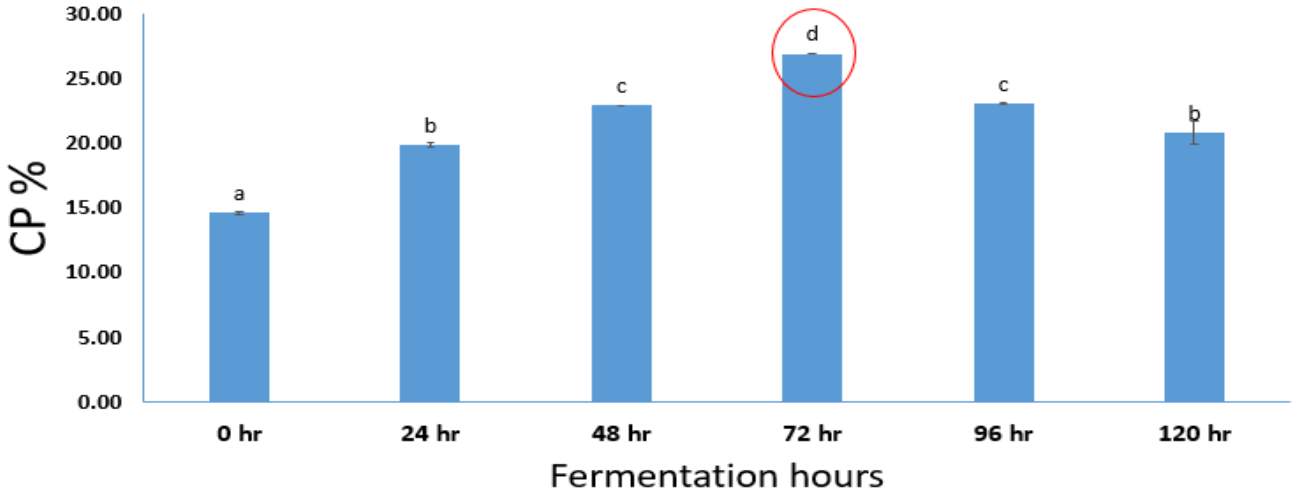
Non-starch polysaccharides (NSPs)

Various Anti-nutritional factors (ANFs)

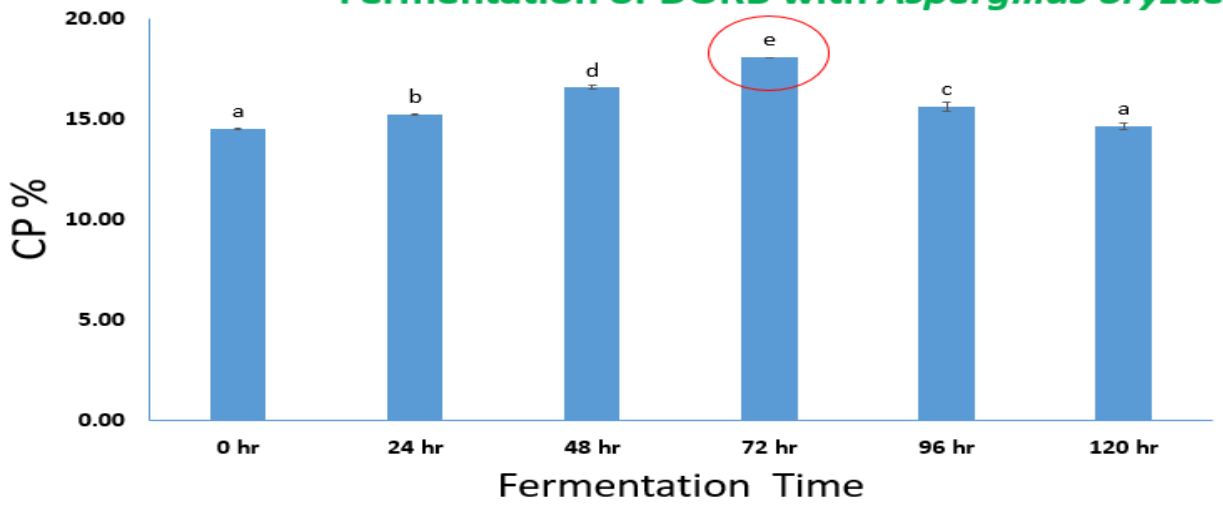
Strategies to maximize utilization of DORB in fish feed



Fermentation of DORB with *Rhizopus oryzae*



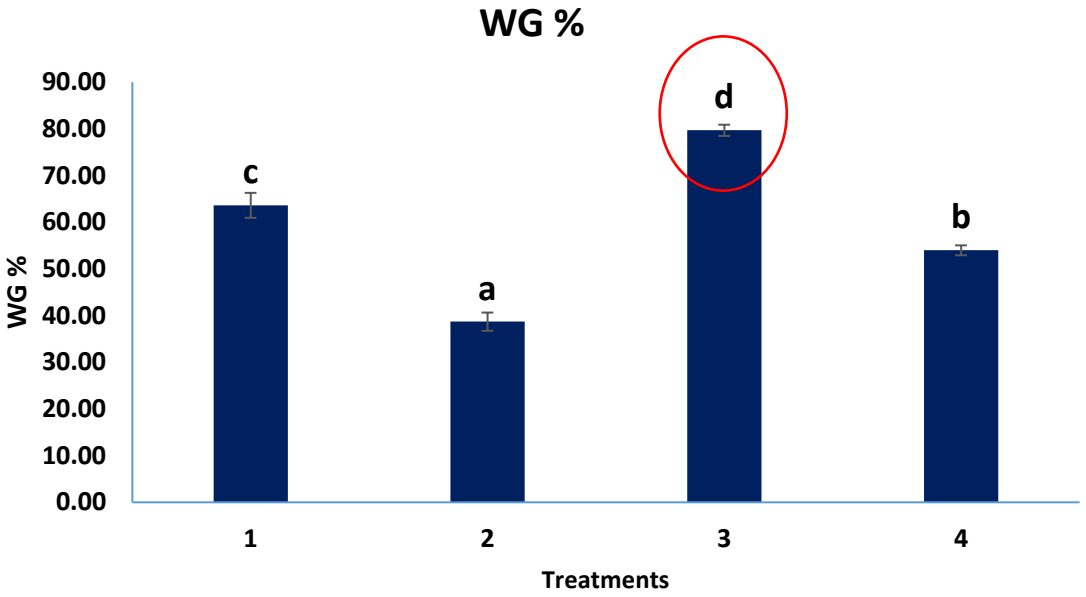
Fermentation of DORB with *Aspergillus oryzae*

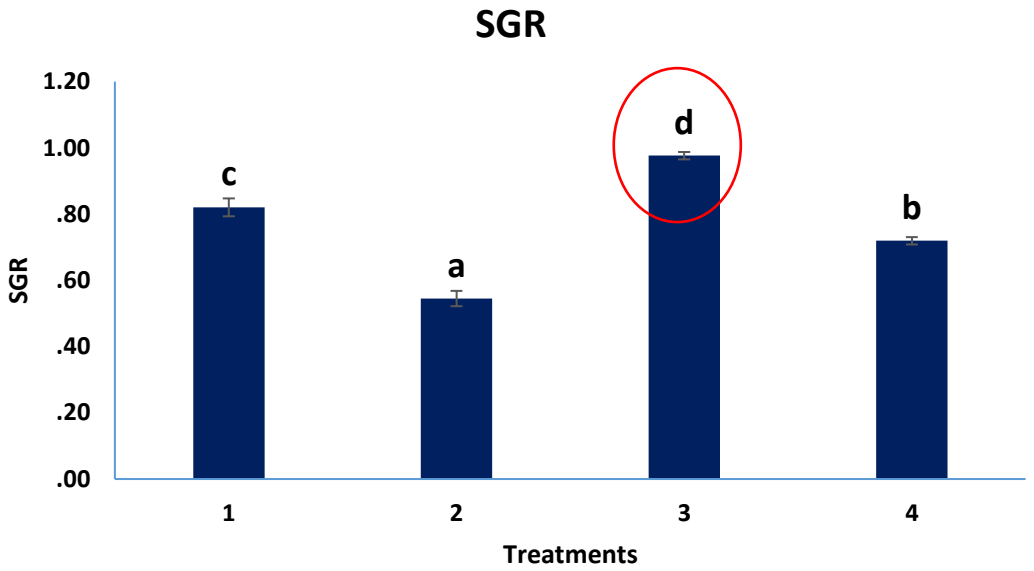


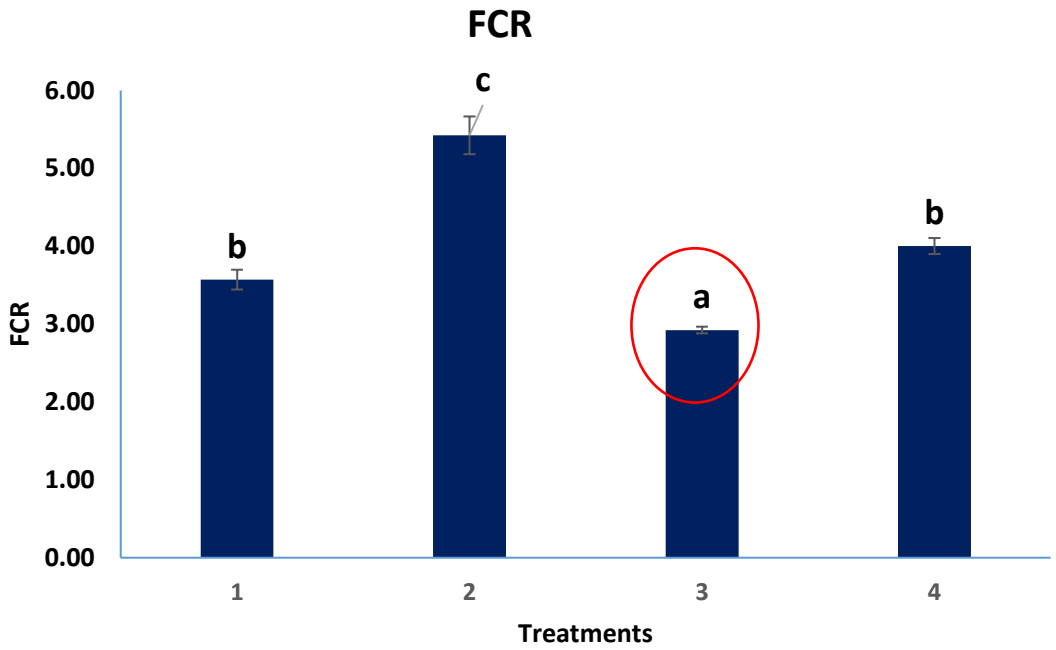
Amino acid (% of total protein)			
Indispensable amino acid	DORB	FDORB	% Increase/Decrease
ARGININE	12.82	12.48	2.7↓
HISTIDINE	2.65	3.68	38.9↑
ISOLEUCINE	4.45	4.72	6.1↑
LEUCINE	8.71	4.90	43.7↓
LYSINE	**2.81**	**12.57**	**347.3↑**
PHENYLALNINE	5.67	4.78	15.7↓
METHIONINE	2.17	3.07	41.5↑
THREONINE	6.93	7.94	14.6↑
VALINE	5.76	5.07	12.0↓
Dispensable amino acid			
ALANINE	9.12	4.41	51.6↓
GLYCINE	9.06	9.89	9.2↑
ASPARTIC ACID	14.64	6.76	53.8↓
GLUTAMIC ACID	8.27	10.18	23.1↑
SERINE	4.07	7.37	81.1↑
TYROSINE	2.86	2.17	24.1↓

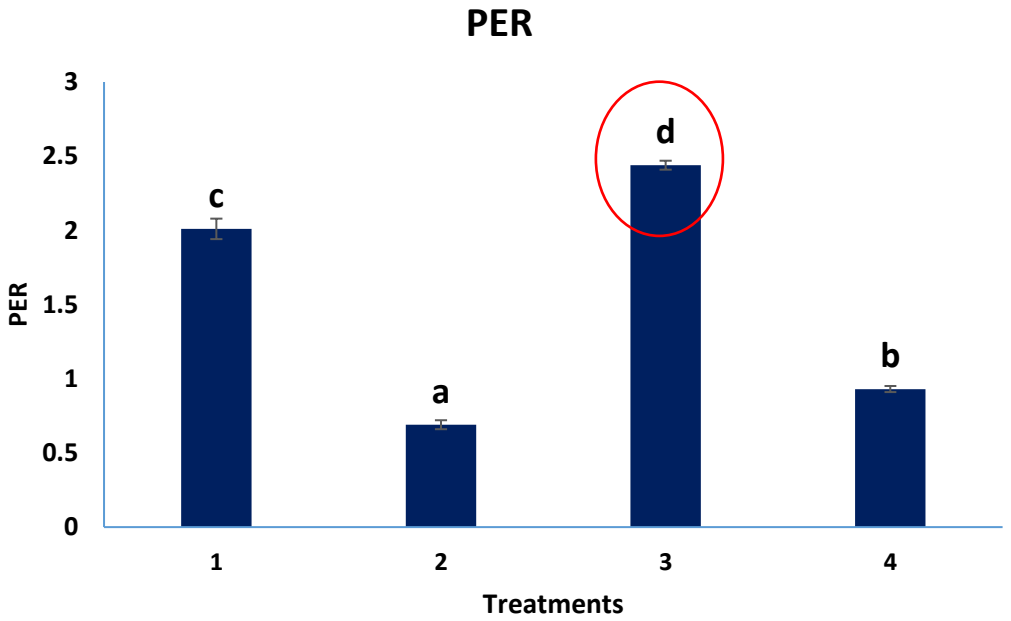
Fatty acid Profile of DORB and FDORB

Fatty acids profile (%)	DORB	FDORB	% Increase(↑)/Decrease(↓)
C14:0	ND	0.29	29↑
C15:0	ND	5.81	581↑
C16:0	30.16	22.11	26.69↓
C17:0	0.12	2.92	2333↑
C18:0	ND	0.08	8↑
C18:1n-9	23.77	20.44	14.01↓
C18:2n-6	28.9	30.69	6.19↑
C18:3n-3	9.57	4.41	53.92↓
C20:0	ND	1.92	192↑
C20:5n-3	ND	ND	
C22:6n-3	ND	ND	
C24:0	7.48	8.79	17.5↑
C26:0	ND	2.54	254↑
SFA	30.28	44.46	46.83↑
MUFA	23.77	20.44	14.01↓
PUFA	38.47	35.1	8.76↓
ω-6	28.9	30.69	6.19↑
ω-3	9.57	4.41	53.92↓


WG %
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
WG %
c
a
d
b
1
2
3
4
Treatments


SGR
1.20
1.00
.80
.60
.40
.20
.00
SGR
c
a
d
b
1
2
3
4
Treatments


FCR
6.00
5.00
4.00
3.00
2.00
1.00
0.00
FCR
b
c
a
b
1
2
3
4
Treatments


PER
3
2.5
2
1.5
1
0.5
0
PER
c
a
d
b
1
2
3
4
Treatments

Conclusion

Fermentation with *Rhizopus oryzae* although increased the protein content of DORB but due to its poor digestibility cannot be recommended as a suitable microbe for fermentation of DORB.

Present study demonstrated that DORB based diet (inclusion level-90%) along with supplementation of exogenous enzymes (phytase and xylanase), deficient amino acids and fatty acids can be an effective strategy to bring down the FCR, which will not only bring down the future higher demand of DORB but will also give an effective tool to utilize DORB as sole source of ingredient in fish feed.