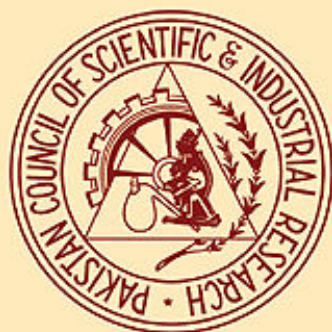


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**Series B: Biological Sciences**

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**Pakistan Journal of Scientific and Industrial Research**  
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**Vol. 59, No. 2, July-August, 2016**

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## Phosphorus Use Efficiency and Yield of Direct Seeded Rice and Wheat Influenced by Residues Incorporation and Phosphorus Application under Saline Soil

Imdad Ali Mahmood<sup>a\*</sup>, Arshad Ali<sup>a</sup>, Armghan Shahzad<sup>b</sup> and Tariq Sultan<sup>a</sup>

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(received September 14, 2015; revised November 27, 2015; accepted December 23, 2015)

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**Abstract.** A two years field study according to split plot design was conducted to investigate the impact of crop residue (CR) incorporation and P application (0, 40, 80, 120 kg P<sub>2</sub>O<sub>5</sub>/ha) on P use efficiency and yield of direct seeded rice (DSR) and wheat grown under saline soil (EC<sub>e</sub> = 4.59 dS/m; pHs = 8.38; SAR = 6.57 (mmol<sub>c</sub>/L)<sup>1/2</sup>; extractable P = 4.07 mg/kg; texture = sandy clay loam), during the years 2011 and 2012. Planting of DSR (with and without crop residue incorporation @ 2 tonnes/ha) were placed in main plots and P application was in sub plots. Data on tillering, plant height, panicle length, 1000 grain weight, paddy and straw yields were collected. On an average of two years, maximum tillers (18), panicle length (33), grain/panicle (121) and paddy yield (3.26 t/ha) were produced with P application @ 80 kg P<sub>2</sub>O<sub>5</sub>/ha along with CR incorporation. Similarly in case of wheat grown after DSR, maximum tillers (17), spike length (17), grains/panicle (66) and grain yield (3.56 t/ha) were produced with P application @ 80 kg P<sub>2</sub>O<sub>5</sub>/ha along with CR incorporation. Although, the growth and yield contributing parameters with this treatment (80 kg P<sub>2</sub>O<sub>5</sub>/ha + CR) performed statistically equal to 120 kg P<sub>2</sub>O<sub>5</sub>/ha without CR incorporation during both the years, but on an average of two years, grain yield of DSR and wheat was significantly superior (22 and 24%, respectively) than that of higher P rate (120 kg/ha) without CR. Overall, continuous two years CR incorporation further increased (17%) paddy yields during the follow up year of crop harvest. Higher P use efficiency and concentrations of P, K<sup>+</sup> and Ca<sup>2+</sup> in both DSR and wheat plant tissues was found where 80 kg P<sub>2</sub>O<sub>5</sub>/ha was applied along with CR incorporation or 120 kg P<sub>2</sub>O<sub>5</sub>/ha alone while Na<sup>+</sup> and Mg<sup>2+</sup> concentration decreased with CR incorporation and increasing P rate. An increasing trend in DSR paddy and wheat grain yields was observed with increasing the rate of P application without CR incorporation, however, it was not as much as that of 80 kg P<sub>2</sub>O<sub>5</sub>/ha application with CR incorporation and found to be superior than rest of the treatments during both study years.

**Keywords:** direct seeded rice, wheat, saline soil, crop residues, P application

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## Effect of Tillage Options and Straw Management on Crops Productivity and Soil Fertility in Rice-Wheat-Cropping Pattern

Md. Ilias Hossain<sup>a</sup>, Md. Israil Hossain<sup>a</sup>, Md. Nur-E-Alam Siddique<sup>a</sup> and Md. Shahidul Haque<sup>b\*</sup>

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(received January 23, 2015; revised January 1, 2016; accepted January 26, 2016)

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**Abstract.** A field experiment was conducted during winter season to study the productivity under three N fertilizer levels (80,100 and 120% N of recommended dose), two levels of straw retention (0 and 30%) and three tillage options (permanent raised bed, fresh bed and conventional tillage practice) in a Rice-Wheat cropping system. Tillage options have been found to affect thousand grain weight (TGW) and grain yield where 49.6, 52.9 and 54.7 g for TGW and 3.77, 3.98 and 4.41 t/ha for grain yield for conventional, permanent bed and fresh bed, respectively were found for wheat. The spikes/m<sup>2</sup> was 343, 322 and 337 while, the spikelets/spike were recorded as 17.2, 17.6 and 17.8 for conventional, permanent and fresh bed, respectively. Different tillage options were found to cause the formation of grains/spike, 43.2, 49.7 and 50.8, respectively. Therefore, other yield components were assumed to be enhanced in response to fresh bed tillage option. Fresh bed with 30% straw retention produced highest productivity and similar results were also obtained from permanent beds with 30% straw retention. Fresh bed with 120% recommended N produced the highest productivity for wheat which was similar to permanent bed with 120% N. The increase in yield was associated with progressive increase in all growth components and will give a new insight to identify the strategy for the development of wheat and other crops cultivation.

**Keywords:** tillage options, N fertilization, straw management, sequential cropping system, wheat yield

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## Comparative Efficacy of Some Quinolones and Doxycycline Against Chronic Infection of *Brucella melitensis* 16M in BALB/c Mice

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P.O. Box 6091, Damascus, Syria

(received April 8, 2015; revised December 3, 2015; accepted December 22, 2015)

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**Abstract.** This study was undertaken to observe various treatment methods for brucellosis caused by *Brucella melitensis*. The effect of therapeutic regimens with ciprofloxacin, ofloxacin and levofloxacin alone or in combination with doxycycline was assessed against *B. melitensis* chronic infection using 200 mice. Doxycycline alone or in combination with ciprofloxacin was significantly found to reduce the infection till 135 days post-infection ( $p < 0.0001$ ). Moreover, doxycycline was more effective than ciprofloxacin and ofloxacin 135 days post-infection ( $p = 0.04$  and  $p = 0.02$ , respectively). However, treatment with quinolone-doxycycline combinations revealed synergistic effects as they were able to reduce the splenic cell forming unit (CFU) from day 45 post-infection. Similarly, doxycycline treatment reduced the splenic colony forming unit (CFU) from day 90 post-infection. In conclusion, doxycycline seems to be the most effective agent against *Brucella* chronic infection.

**Keywords:** doxycycline, quinolones, *Brucella melitensis*, BALB/c mice

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# Improvement of Amylase Production by UV Mutagenesis of *Aspergillus flavus* FSS63 under Solid State Fermentation

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(received February 2, 2015; revised November 5, 2015; accepted November 13, 2015)

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**Abstract.** Enhancement of the amylase productivity by *Aspergillus flavus* was investigated. Spores of strain were exposed to ultraviolet (UVC) radiation and 10 different mutants were selected and isolated from starch plate agar on the basis of the visible clearance zone around the colonies. The amylase production by selected mutants was evaluated under solid state fermentation. One mutant of *A. flavus* FSS63UV8 showed higher biosynthesis level of amylase (733 IU/g), which was 3.35 fold higher than that detected in the parental strain. Physical parameters optimisation revealed that the optimum pH and temperature for amylase production obtained by mutant are 7.0 and 35°C, respectively. Among several tested agricultural wastes, wheat bran was found to support the highest yield of amylase after 5 days of incubation. *A. flavus* FSS63UV8 strain proved to be a promising microorganism for a high amylase production in a simple medium.

**Keywords:** *Aspergillus flavus*, amylase, ultraviolet radiation

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## Antibacterial Activity and Optimisation of Bacteriocin Producing Lactic Acid Bacteria Isolated from Beef (Red Meat) Samples

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(received June 11, 2015; revised January 27, 2016; accepted January 29, 2016)

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**Abstract.** Bacteriocin producing bacteria are commonly found in meat products to enhance their shelf-life. In the present study, bacterial species were isolated from meat samples (beef) from different localities of Lahore, Pakistan. MRS agar medium was used to isolate lactic acid bacteria (LAB) through spread and streak methods (incubated for 72 h at 37 °C). Identification of bacteriocinogenic LAB strains was done by using staining techniques, morphology based characteristics and biochemical tests. These strains were BSH 1b, BSH 3a, BIP 4a, BIP 3a, BIP 1b and BRR 3a. Antibacterial activity of LAB was performed against food borne pathogens viz., *Escherichia coli* and *Staphylococcus aureus* through paper disc diffusion method. Three bacterial strains showed maximum inhibition and characterised by ribotyping viz., BIP 4a was identified as *Lactobacillus curvatus*, BIP 3a was *Staphylococcus warneri* and BIP 1b was *Lactobacillus graminis*. Optimum pH 5-6.5 and 30-37 °C temperature for isolated bacterial strains was recorded. Protein concentration measured was 0.07 mg/mL for BSH 1b, 0.065 mg/mL for BSH 3a, 0.057 mg/mL for BIP 4a, 0.062 mg/mL for BIP 1b, 0.065 mg/mL for BIP 3a and for BRR 3a 0.078 mg/mL, respectively. Bacteriocin of all isolates except BIP 3a was found to be sensitive towards pepsin and resistant towards Rnase. Bacteriocin production was stable at between pH 5.0 and 6.0 and resistant temperature towards 40 °C. It was concluded that lactic acid bacteria (LAB) from meat can be helpful as antibacterial agents against food-borne bacterial pathogens because of thermostable producing bacteriocin.

**Keywords:** antibacterial activity, bacteriocin, lactic acid bacteria, ribotyping

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## **Antiplasmodial Activity of Methanolic Extract of *Asparagus officinalis* L. Stem on *Plasmodium berghei* Infected Mice**

**Joseph Bamidele Minari<sup>a\*</sup>, Adewale. Agboola Odutuga<sup>b</sup>, Fisayo Abraham Bamisaye<sup>c</sup> and Leye Jonathan Babatola<sup>b</sup>**

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(received January 08, 2015; revised November 24, 2015; accepted December 12, 2015)

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**Abstract.** This study aims at investigating the antiplasmodial activity of methanolic extract of *Asparagus officinalis* L. stem on *Plasmodium berghei* infected mice. To investigate this, the mice were infected with *P. berghei* to cause malaria. The mice were simultaneously given oral doses (20, 40 and 60 mg/kg body weight) of methanolic extract of *A. officinalis* L. stem. The phytochemical constituents of the extract revealed the presence of alkaloids, phenolics, cardiac glycosides, flavonoids, terpenoid and steroid. The extract administered to the infected mice significantly suppressed the parasite. The extract also significantly ( $P < 0.05$ ) reduced the activities of serum aspartate aminotransferase (AST), alkaline phosphate (ALP), alanine aminotransferase (ALT). White blood corpuscles (WBC), red blood corpuscles (RBC), hemoglobin (HGB), packed cell volume (PCV), platelets (PLT) and the mean corpuscular hemoglobin concentration (MCHC) showed significant ( $P < 0.05$ ) increase after the administration of the extract while mean corpuscular volume (MCV) and the mean corpuscular hemoglobin (MCH) showed significant ( $P < 0.05$ ) reduction. Present findings suggests that the plant extract contains phytochemicals that have antiplasmodial and hepatoprotective properties.

**Keywords:** antiplasmodial activity, *Asparagus officinalis*, *Plasmodium berghei*, phytochemicals

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## **Enhancement of Oleic Acid in Butter Oil by High Oleic Fraction of *Moringa oleifera* Oil**

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(received January 23, 2015; revised September 14, 2015; accepted October 5, 2015)

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**Abstract.** Oleic acid in butter oil (BO) was enhanced by a high oleic acid fraction (HOF) of *Moringa oleifera* oil (MOO). HOF was blended with BO at four different concentrations i.e. 5%, 10%, 15% and 20% (HOF-5, HOF-10, HOF-15 and HOF-20, respectively), compared with a control (BO). The oleic acid in HOF increased from 71.55% to 80.25%. DPPH free radical scavenging activity and total flavonoid content of HOF was 76.88% and 34.52 mg/100 g. Supplementation of butter oil with 20% HOF, decreased the cholesterol from 224 to 177 mg/100 g. Peroxide value of three months stored HOF-20 was 1.18 (meqO<sub>2</sub>/kg) as compared to control, 3.15 (meqO<sub>2</sub>/kg). Induction period of HOF-20 was 4.07 h greater than control. These results evidenced that oleic acid in butter oil can be substantially increased by HOF of MOO.

**Keywords:** high oleic acid fraction, *Moringa oleifera* oil, fractionation, butter oil

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## Review

# Purification and Application of Lipases from *Pseudomonas* Species

Saadat Ullah<sup>a\*</sup>, Ijaz Malook<sup>a</sup>, Khair Ul Bashar<sup>a</sup>, Mehvish Riaz<sup>a</sup>, Muhammad Mudasar Aslam<sup>b</sup>, Zia Ur Rehman<sup>a</sup>, Irfan Malook<sup>c</sup>, Muhammad Fayyaz<sup>a</sup> and Muhammad Jamil<sup>a</sup>

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(received October 20, 2015; revised February 23, 2016; accepted February 29, 2016)

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**Abstract.** Lipases are important hydrolytic enzymes that hydrolyze long chain triacylglycerol into diacylglycerol, monoacylglycerol, glycerol and fatty acids. Lipases are found in microorganisms, fungi, plants and animals. Commercially, useful extracellular lipases are isolated from different bacterial species, including *Bacillus*, *Achromobacter*, *Alcaligenes*, *Arthrobacter*, *Pseudomonas*, *Staphylococcus* and *Chromobacterium* species. Among the *Pseudomonas* species, *Pseudomonas aeruginosa*, *P. cepacia* and *P. fluorescence* are the major producers of lipases. Bacterial lipases have great industrial applications because of their stability, selectivity and broad substrate specificity. Due to their large scale application in industrial sectors, attention is given to isolate *Pseudomonas* lipases. In this review, purification strategies for lipases isolated from *Pseudomonas* species have been focussed.

**Keywords:** lipases, *Pseudomonas*, industrial applications, purification strategies

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