

GL-FP1.3.4.3: Screening chickpea genotypes with rhizobium strains under various management interactions

Deliverable #7168: Rhizobium strains tested

Experiment: Improving biological nitrogen fixation (BNF) capacity and productivity of chickpea through bio-inoculants and management practices

Title	:	Improving biological nitrogen fixation (BNF) capacity and productivity of chickpea through bio-inoculants and management practices																																								
Objectives	:	Determine the effect of bio-inoculants and molybdenum on productivity and BNF efficiency in chickpea varieties Determination of the best combination of variety x rhizobia x fertilization for N ₂ -fixation in chickpea																																								
Outputs	:	Best variety, rhizobium strain and management practices determined for higher N ₂ -fixation in chickpea																																								
Materials and methods		<p>The experiment was conducted during <i>Rabi</i> 2015-16 at the ICARDA – FLRP, Amlaha, Sehore (M.P.), India. The treatment included four inoculants, control, Ammonium Molybdate (Mo @ 1g/kg seed treatment), Rhizobium + PSB and Rhizobium + PSB + Mo (@ 1g/kg seed treatment) and three Kabuli varieties (RVSJKG 102, Phule G 0517, PKV 4) for estimate the individual or combined effect of various treatment on production at field level.</p> <p>A similar experiment was conducted at ICARDA experimental station, Marchouch, Morocco during winter and spring 2015-16 with treatment combination of four chickpea varieties (Arifi; Moubarak; FLIP09-213C; FLIP09-314C), four seed inoculations (Uninoculated (RDF); Rhizobium strain (CP-72); 1 g Mo seed treatment; Rhizobium + 0.5 g Mo) and two planting season (winter; spring).</p>																																								
Results	:	<p>The results study conducted at India indicated that seed inoculants with Rhizobium + PSB + Mo was found best among other inoculants in respect to productivity and profitability. Variety PKV 4 produced higher values of growth and yield attributing parameters, seed and biological yields of kabuli chickpea (Table 1 and 2). Treatment combination Rhizobium + PSB+ Mo with Phule G 0517 on seed index proved better combinations for higher production. The economics of various treatments, highest gross return was obtained in Rh.+ PSB + Mo seed inoculants (INR 126665/ha) with net profit (INR 107592/ha) and highest B:C ratio (6.8).</p> <p>Table 1: Yield attributing traits influenced by inoculants and varieties.</p> <table border="1"> <thead> <tr> <th>Treatments</th> <th>Pods/ plant (No.)</th> <th>Seeds/pod (No.)</th> <th>Seed yield/plan t (g.)</th> <th>Seed index (g)</th> </tr> </thead> <tbody> <tr> <td colspan="5">Seed inoculants</td> </tr> <tr> <td>Control</td> <td>26.7</td> <td>1.06</td> <td>17.5</td> <td>46</td> </tr> <tr> <td>Molybdenum seed inoculants</td> <td>29.6</td> <td>1.07</td> <td>17.9</td> <td>48.4</td> </tr> <tr> <td><i>Rhizobium</i> + PSB seed inoculants</td> <td>32</td> <td>1.07</td> <td>18.4</td> <td>48.9</td> </tr> <tr> <td><i>Rhizobium</i>+ PSB + Mo seed Inoculants</td> <td>34.2</td> <td>1.08</td> <td>19.9</td> <td>51.1</td> </tr> <tr> <td>SEm±</td> <td>0.5</td> <td>0.003</td> <td>0.50</td> <td>1.03</td> </tr> <tr> <td>CD @ 5%</td> <td>1.4</td> <td>0.009</td> <td>1.5</td> <td>3.01</td> </tr> </tbody> </table>	Treatments	Pods/ plant (No.)	Seeds/pod (No.)	Seed yield/plan t (g.)	Seed index (g)	Seed inoculants					Control	26.7	1.06	17.5	46	Molybdenum seed inoculants	29.6	1.07	17.9	48.4	<i>Rhizobium</i> + PSB seed inoculants	32	1.07	18.4	48.9	<i>Rhizobium</i> + PSB + Mo seed Inoculants	34.2	1.08	19.9	51.1	SEm±	0.5	0.003	0.50	1.03	CD @ 5%	1.4	0.009	1.5	3.01
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Varieties				
RVSJKG 102	29.8	1.06	17.17	55.4
Phule G 0517	30.5	1.07	17.88	54.7
PKV 4	31.5	1.08	20.18	35.8
SEm±	0.4	0.003	0.43	0.9
CD @ 5%	1.2	0.008	1.3	2.6

Table 2: Response of seed inoculant and variety on seed yield kg/ha, straw yield kg/ha and harvest index (%).

Treatments	Seed yield (kg/ha)	Biological yield (kg/ha)	Harvest index (%)
Seed inoculants			
Control	1253	3490	35.9
Molybdenum seed inoculants	1402	4037	35.1
<i>Rhizobium</i> + PSB seed inoculants	1599	4315	37.2
<i>Rhizobium</i> + PSB + Mo seed Inoculants	1878	5224	36.1
SEm±	43	152	0.7
CD @ 5%	125	445	NS
Varieties			
RVSJKG 102	1435	3895	37.0
Phule G 0517	1539	4321	35.9
PKV 4	1625	4584	35.4
SEm±	37	131	0.6
CD @ 5%	108	385	NS

The similar results were obtained in the study conducted at Morocco. The results indicated that application of recommended dose of fertilizer (RDF) in chickpea along with *Rhizobium* inoculation and seed treatment with ammonium molybdate 1 g/kg of seed, significantly increased number and dry weight of nodule, plant height and pods/plant, chlorophyll content in leaves over control (RDF alone).

Thesis : Master thesis entitled "Improving biological nitrogen fixation capacity and productivity of kabuli chickpea (*Cicer kabulinium* L.) varieties by PSB and molybdenum applications" submitted to Jawaharlal Nehru Agricultural University, Jabalpur, India by Mr. Rahul Badole.