

FIELD EVALUATION REPORT 2018-19

On

To Study a Bio-Efficacy of Product PSAP, 'Potassium Salt of Active Phosphorous' On Soybean



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Submitted by

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Introduction

Soybean (*Glycine max*), is known as a 'miracle crop' with over 40% protein and 20% oil, soybean crop was introduced in Madhya Pradesh during the later part of 1960's, its spread in the state has been remarkable. Madhya Pradesh also known as soybean bowl of India. Currently Madhya Pradesh state contributes about 58% and 52 % in total area and production of soybean and is called as 'Soya state'. Importance on this present study was undertaken with the objective to examine the plant growth and yield contributing parameters, disease and pest etc. management of disease and pest with the help of potassium salt and active phosphorus use for control the disease intensity in soybean crop because The phytopathogens have been combated effectively by foliar spray of chemical fungicides like copper ox- chloride, matalaxyl + mancozeb, etc. However, the phytotoxicity of such fungicides coupled with prolonged persistence in tissue and huge residue accumulation in soil have resulted in dread full consequences with respect to environment and human health. In this sequence nutrients also play vital role in crop production phosphorus and potassium play a major role in photosynthesis to regulate the opening and closing of stomata, and therefore regulate CO₂ uptake. Potassium triggers activation of enzymes and is essential for production of (ATP) is an important energy source for many chemical processes taking place in plant issues. The metabolic processes and potash (K) is important to induce ability to tolerate plant in adverse conditions. Its plays a major role in the regulation of water in plant (osmo-regulation). An experiment was made to examine effect of potassium salt and active phosphorus on soybean crop in district Dewas, (M.P.) and following objective for experiment given by the Isha Agro India for the assessment of the chemical (PSAP@ 4gL⁻¹).

Objectives

- (i) To assesses the effect of PSAP on growth, yield and quality contributing parameters
- (ii) To find out the role of PSAP against insect pest and disease incidents in soybean
- (iii) To knows the effect of PSAP on soil.



Materials and Methods:

A field trial was conducted to find out the effect of PSAP on soybean crop at instructional farm, of Krishi Vigyan Kendra Dewas, during kharif 2018. The experiment comprises of 9 treatments, Table 2. and replicated thrice. The experimental plot size was 2.5M X4M and maintained isolation distance 0.5M between PXP which was laid out in randomized block design Table 1. The soils of experimental plot was analysed before conduction of the trial. Soil was alkaline in nature and available Nitrogen and Phosphorus ranges between low to medium and potassium at higher side while micronutrients were generally below critical level (Table 6a).

The soybean crop early maturing variety JS-2034 was selected for the experimental trial and sown at 30 cm row to row distance on 27 July 2018 by adopting all technological packages and practices i.e; seed treatment, weeding etc. The seeds were treated by the fungicide carboxin 37.5% + thiram 37.5% @ 2.5 gm per kg, insecticides thiamethoxazone 30FS @ 10 ml per kg, and rhizobium and phosphate solubilizing bacteria @ of 5ml each/kg of seed, respectively. Recommended doses of fertilizer N: P: K: S @ of 25: 60: 40: 40 were applied as basal dose at the time of sowing through straight fertilizers like urea, SSP, and MOP. The standard integrated plant protection measure was followed like that Ist spray of trizophous on 25 August. 2018 and IInd spray of propanophous on 18th Sep. 2018, respectively. The product potassium salt and active phosphorous (PSAP) was tested as per given protocol under the experiment which was supplied by Isha Agro Science Pvt. Ltd. Pune India. The Ist spray of PSAP @ 4gL⁻¹ was applied on dated 04 Sep. 2018, 40 DAS at Pre-flowering stage, IInd Spray on dated 19 Sep. 2018 at 55 DAS and IIIrd Spray on dated 04 Oct. 2018 at 70 DAS, simultaneously. The observations of various yield attributes (i.e; plant height, no. of pods per plant, no. of grains per pod, weight of grain per plant, 100 seed weight etc.) and quality contributing parameters (i.e; trypsin inhibitor , protein% and fat %,) insect pest and disease incident and effect on soil parameters were recorded time to time during the experiment. The data for insect and pest infestations were taken pre and post spray of insecticide. The pool data were analyzed by adopting simple RBD design.



Table 1. Layout of PSAP Experiment

| | | | | | | | | | |
|---------------------|------|------|------|------|------|------|------|------|------|
| R1 | T1R1 | T3R1 | T2R1 | T4R1 | T6R1 | T5R1 | T8R1 | T7R1 | T9R1 |
| ↑↓ 01 Meter path | | | | | | | | | |
| R2 | T2R2 | T4R2 | T1R2 | T3R2 | T8R2 | T7R2 | T9R2 | T6R2 | T5R2 |
| ↑↓ 01 Meter path | | | | | | | | | |
| R3 | T6R3 | T5R3 | T7R3 | T2R3 | T4R3 | T1R3 | T3R3 | T8R3 | T9R3 |

0.5 Meter distance between each plot

Table 2. The details of treatments

| No. of Treatments | Treatments Details |
|-------------------|---|
| T1 | RDF + plant protection measure |
| T2 | RDF + plant protection measure + PSAP @ 4gL ⁻¹ |
| T3 | RDF+50 % plant protection measure |
| T4 | RDF+50 % plant protection measure + PSAP @ 4gL ⁻¹ |
| T5 | Recommended dose N + 50 % P, K & plant protection measure |
| T6 | Recommended dose N + 50 % P, K & plant protection measure + PSAP @ 4gL ⁻¹ |
| T7 | Recommended dose N+ 50 % P, K & 50 % plant protection measure |
| T8 | Recommended dose N+50 % P, K & 50 % plant protection measure + PASP @ 4gL ⁻¹ |
| T9 | Recommended dose N + PASP @ 4gL ⁻¹ |

(Signature)

Results

1. Yield attributes and quality contributing parameters:

The results showed that the application of PSAP increased; yield contributing parameters and yield of soybean. The maximum plant height (78.93 cm) was observed in treatment no. 2 (*i.e* RDF+PPM+PSAP) while minimum (73.93 cm) in Treatment no. 9 (*i.e*; RDN and PSAP). The similar trends were also observed for no of pods per plant, no. of grain per plant, weight of grain per plant, yield per plot, respectively. (Table 3). The maximum yield 23.34 q/ha was recorded with application of PSAP along with RDF and plant protection measures while the minimum yield was noticed in case of PSAP application with RDN only. It also seen that yield was significantly higher in treatment no. 2 as compare to treatment no. 9.

Data of experiment revealed that application of potassium salt of active phosphorus on grain quality of soybean *i.e*; trypsin inhibitor activity was higher (8.34 mg/g) in Treatment no. 2, as compare to Treatment no.1, (7.44 mg/g), while the reverse trend was observed in case of Protein and fat percentage which was higher in treatment no. 1 as compare to treatment no. 2. (Table.4)

It also observed that there was no significant difference in B: C ratio values of PSAP application. Which was at par in treatment no.1 and 2

2. Effect on insect pest and disease incident

The data of experiment Table no.5 revealed that the minimum Whiteflies (2.80, 3 leaf /plant), tobacco caterpillar (0.17) and Girdle beetle (0.87) population were recorded as compare to others while the maximum was found in treatment no. 9, may be due to vegetative foliage. The green semilooper (0.53mrl) was significantly lower in treatment no. 2, as compare to treatment no. 9, Likewise similar trend were also observed in case of YVM and Anthracnose disease which had lower value in treatment no. 1, due to proper adaption of plant protection measures in the experiment as compares to others. The percentage of pod damage was at par in treatment no. 1 (4.31) and 2 (4.37). From the data it clear indication that the friend insects (natural enemies) *i.e* Coccinella; (1.73) chrysoperla (1.53) and predatory spider (2.13) population were maximum in treatment no. 9, as compare to treatment no. 1 It was observed that the RDF +PPM and PSAP have no significant impact on insect pest control in soybean crop.

The phytotoxic effect was not observed after the application of PSAP in soybean crop.

Table 3. Effects of PSAP on, yield attributes and yield of soybean

| Treatments | Plant height (cm) | No. of pods/plant | No. of grain/plant | weight of grain/plant. (gm) | yield of per plot (kg) | yield q/ha |
|---|-------------------|-------------------|--------------------|-----------------------------|------------------------|------------|
| RDF+plant protection | 77.40 | 18.13 | 54.40 | 6.53 | 3.33 | 22.20 |
| RDF+plant protection+PSAP | 78.93 | 19.07 | 57.20 | 6.86 | 3.50 | 23.34 |
| RDF+50 %plant protection | 75.47 | 14.87 | 44.60 | 5.35 | 2.73 | 18.20 |
| RDF+50 %plant protection+PSAP | 76.33 | 15.13 | 45.40 | 5.45 | 2.78 | 18.52 |
| Recomded Jose N+50 % P, K & plant protection | 77.00 | 16.60 | 49.80 | 5.98 | 3.05 | 20.32 |
| Recomded dose N+50 % P, K & plant protection+ PSAP | 78.53 | 17.13 | 50.76 | 6.09 | 3.11 | 20.71 |
| Recomded dose N+50 % P, K & 50 %plant protection | 76.60 | 15.40 | 46.20 | 5.54 | 2.83 | 18.85 |
| Recomded dose N+50 % P, K & 50 %plant protection+PASP | 77.13 | 15.60 | 46.80 | 5.62 | 2.86 | 19.09 |
| Recomded dose N+PASP | 73.93 | 14.20 | 40.60 | 4.67 | 2.37 | 16.48 |
| SEm (+) | 0.7727 | 0.4520 | 1.2306 | 0.1451 | 0.0734 | 0.4892 |
| CD at 5% | 2.3165 | 1.3551 | 3.6892 | 0.4349 | 0.2201 | 1.4666 |
| CV | 3.161306 | 8.7485 | 7.9873 | 7.8758 | 7.8219 | 7.7861 |

Table 4. Effect of PSAP on grain quality parameter of soybean

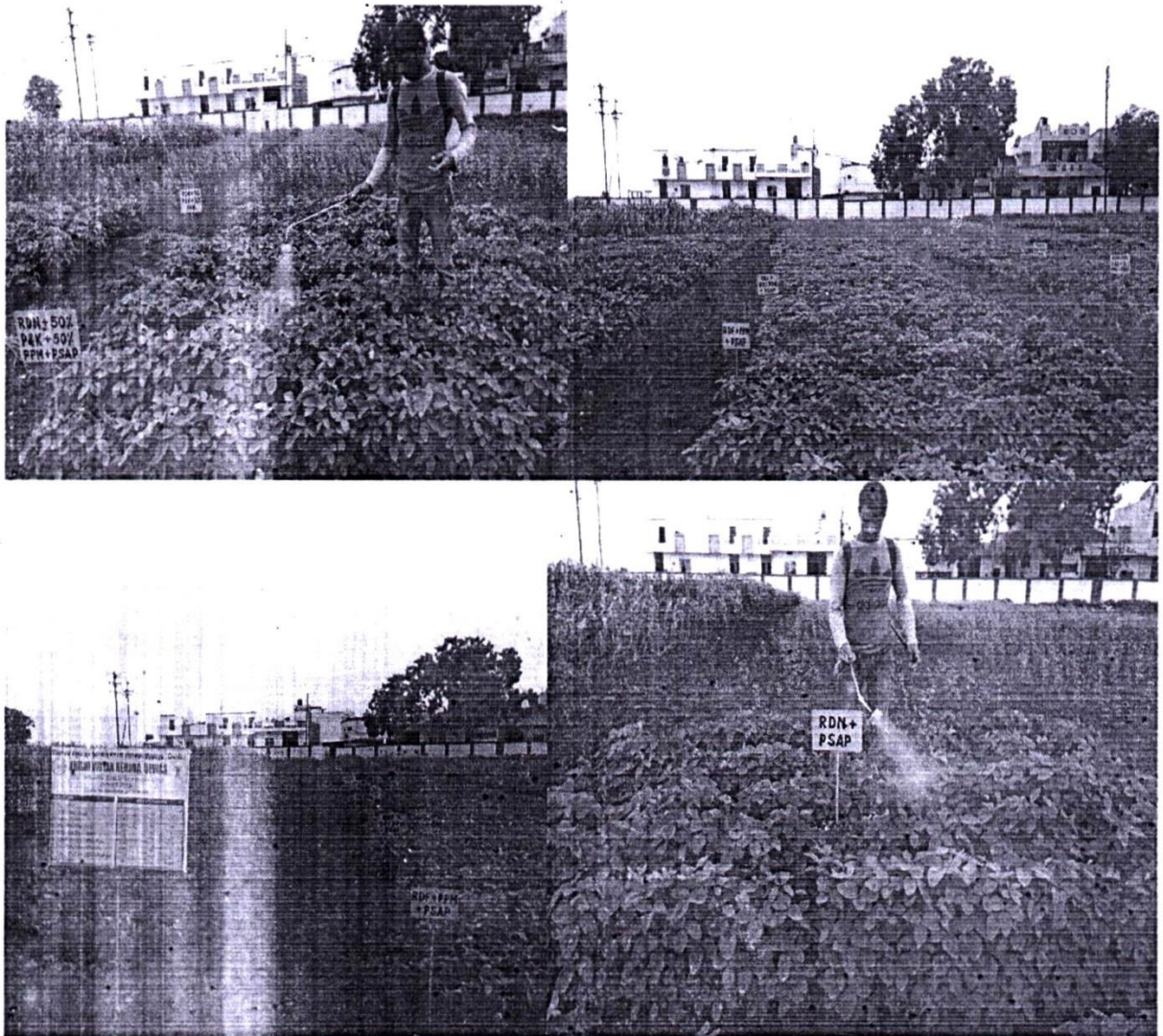
| Parameters | T1D | T2D |
|--|------------|------------|
| Trypsin Inhibitor Activity (mg/g samples) | 7.44 | 8.34 |
| Protein % | 42.03 | 41.40 |
| Fat % | 20.24 | 20.15 |



TABLE 5: Effect of PSAP on incidents of insect, pest, disease and natural funa

| Treatment | Whitefly 3leaf/plant | | Green semilooper (mrl) | | Tobacco Caterpillar (mrl) | | Girdle beetle (mrl) | | Pod damage (%) | Yellow vein mosaic (PDI) | Anthracn ose (PDI) | Coccinell a (mrl) | chrysoper la | Predato ry spider |
|--|-------------------------|----------------|---------------------------|----------------|------------------------------|----------------|------------------------|----------------|----------------------|-----------------------------------|--------------------------|----------------------|-----------------|-------------------------|
| | BF | AF | BF | AF | BF | AF | BF | AF | | | | | | |
| RDF+plant protection | 4.87 (2.32) | 2.80 (1.82) | 3.83 (2.08) | 0.57 (1.03) | 1.27 (1.33) | 0.17 (0.82) | 1.13 (1.28) | 0.87 (1.17) | 4.37 (1.05) | 1.24 | 1.22 | 0.27 | 0.40 | 0.60 |
| RDF+plant protection+PSAP | 4.83 (2.31) | 2.87 (1.83) | 3.50 (2.00) | 0.53 (1.02) | 1.23 (1.32) | 0.20 (0.84) | 1.03 (1.24) | 0.93 (1.20) | 4.31 (1.08) | 1.25 | 1.28 | 0.33 | 0.33 | 0.67 |
| RDF+50 %plant protection | 4.80 (2.30) | 4.27 (2.18) | 4.75 (2.29) | 1.13 (1.28) | 1.27 (1.33) | 1.53 (1.43) | 2.13 (1.62) | 2.20 (1.64) | 7.71 (1.20) | 2.36 | 2.36 | 0.53 | 0.60 | 0.93 |
| RDF+50 %plant protection+PSAP | 4.83 (2.31) | 3.93 (2.11) | 4.17 (2.16) | 1.10 (1.26) | 1.20 (1.30) | 1.47 (1.40) | 2.07 (1.60) | 2.13 (1.62) | 7.07 (1.14) | 2.17 | 2.17 | 0.60 | 0.53 | 0.80 |
| Recomded dose N+50 % P. K & plant protection | 4.87 (2.32) | 3.07 (1.89) | 5.25 (2.40) | 0.73 (1.11) | 1.20 (1.30) | 0.73 (1.11) | 1.20 (1.30) | 1.40 (1.38) | 6.14 (1.00) | 1.75 | 1.75 | 0.27 | 0.47 | 0.50 |
| Recomded dose N+50 % P. K & plant protection+ PSAP | 4.80 (2.30) | 3.13 (1.91) | 5.17 (2.38) | 0.77 (1.13) | 1.20 (1.30) | 0.70 (1.10) | 2.20 (1.64) | 1.67 (1.47) | 6.25 (0.98) | 1.72 | 1.72 | 0.37 | 0.33 | 0.47 |
| Recomded dose N+50 % P. K & 50 %plant protection | 5.00 (2.35) | 4.43 (2.22) | 5.08 (2.36) | 1.23 (1.32) | 1.23 (1.32) | 1.23 (1.32) | 2.40 (1.70) | 2.80 (1.82) | 8.61 (1.11) | 2.37 | 2.37 | 0.53 | 0.47 | 0.73 |
| Recomded dose N+50 % P. K & 50 %plant protection+PASP | 4.60 (2.26) | 4.40 (2.21) | 5.33 (2.42) | 1.20 (1.30) | 1.30 (1.34) | 1.17 (1.29) | 2.20 (1.64) | 2.73 (1.80) | 8.49 (1.14) | 2.44 | 2.44 | 0.60 | 0.53 | 0.80 |
| Recomded dose N+PASP | 4.80 (2.30) | 5.20 (2.39) | 5.50 (2.45) | 4.02 (2.13) | 1.23 (1.32) | 1.83 (1.53) | 3.13 (1.91) | 3.20 (1.92) | 15.18 (1.62) | 3.25 | 3.25 | 1.73 | 1.53 | 2.13 |
| SE (m)± | 0.2162 | 0.2766 | 0.3289 | 0.2042 | 0.1269 | 0.1234 | 0.1763 | 0.2121 | 0.1574 | 0.1394 | 0.2398 | 0.1151 | 0.0986 | 0.1574 |
| CD (p=0.05) | 0.6482 | 0.8292 | 0.9859 | 0.6120 | 0.3805 | 0.3699 | 0.5285 | 0.6358 | 0.4718 | 0.4181 | 0.7190 | 0.3450 | 0.2956 | 0.4718 |
| CV | 14.091 6614 | 22.9404 334 | 21.84283 84 | 51.1755 2 | 32.24070 39 | 38.62806 58 | 28.49195 3 | 33.44864 27 | 58.31506 73 | 32.73219 3 | 36.566399 7 | 62.19031 22 | 53.632053 | 58.3150 673 |

Experimental plots of soybean at various dose of fertilizers, PPM and PSAP



A. F.

(b) Effect of PSAP on soil post pH, EC, major and micronutrient

| Treatments | pH | EC | OC | N | P | K | S | Zn | B | Fe | Mn | Cu |
|--|----------------|----------------|----------------|----------------|----------------|--------------|----------------|----------------|----------------|----------------|----------------|--------------|
| RDF+plant protection | 7.47 | 0.36 | 0.43 | 197.67 | 16.24 | 282.67 | 13.30 | 0.48 | 0.44 | 6.05 | 3.34 | 0.38 |
| RDF+plant protection+PSA P | 7.53 | 0.36 | 0.48 | 196.67 | 16.83 | 304.33 | 14.08 | 0.51 | 0.48 | 6.81 | 3.90 | 0.49 |
| RDF+50 %plant protection | 7.57 | 0.31 | 0.50 | 199.00 | 15.99 | 268.00 | 13.76 | 0.48 | 0.50 | 6.13 | 3.27 | 0.47 |
| RDF+50 %plant protection+PSA P | 7.50 | 0.30 | 0.43 | 197.00 | 16.83 | 301.67 | 13.12 | 0.46 | 0.46 | 6.10 | 3.37 | 0.37 |
| Recomded dose N+50 % P, K & plant protection | 7.43 | 0.37 | 0.47 | 199.00 | 15.93 | 292.67 | 13.33 | 0.47 | 0.49 | 6.52 | 3.59 | 0.43 |
| Recomded dose N+50 % P, K & plant protection+ PSAP | 7.34 | 0.39 | 0.52 | 198.67 | 15.10 | 291.00 | 13.37 | 0.51 | 0.46 | 6.19 | 3.27 | 0.49 |
| Recomded dose N+50 % P, K & 50 %plant protection | 7.53 | 0.34 | 0.50 | 197.00 | 14.50 | 282.00 | 13.78 | 0.46 | 0.46 | 6.33 | 3.78 | 0.45 |
| Recomded dose N+50 % P, K & 50 %plant protection+PAS P | 7.57 | 0.35 | 0.45 | 191.00 | 14.31 | 273.33 | 13.33 | 0.46 | 0.47 | 6.83 | 3.65 | 0.42 |
| Recomded dose N+PAS P | 7.53 | 0.33 | 0.40 | 198.33 | 14.03 | 278.00 | 13.22 | 0.46 | 0.45 | 6.28 | 3.35 | 0.36 |
| SEm (+) | 0.0791 | 0.0335 | 0.0445 | 7.0723 | 0.5236 | 9.9261 | 0.5449 | 0.0176 | 0.0218 | 0.6332 | 0.2204 | 0.0249 |
| CD at 5% | 0.2373 | 0.1005 | 0.1333 | 21.2026 | 1.5699 | 29.7584 | 1.6335 | 0.0527 | 0.0654 | 1.8983 | 0.6607 | 0.0745 |
| CV | 3.3175494 7 | 30.515016 4 | 30.019306 5 | 11.129463 8 | 10.597344 8 | 10.9086 4 | 12.706196 7 | 11.604522 2 | 14.655686 7 | 31.280161 3 | 19.779515 9 | 18.1620 4 |

Table 6. (a) Effect of PSAP on soil post pH, EC, major and micronutrient

| Treatments | pH | EC | OC | N | P | K | S | Zn | B | Fe | Mn | Cu |
|---|--------|---------|---------|---------|--------|---------|--------|--------|---------|---------|--------|---------|
| RDF+plant protection | 7.43 | 0.40 | 0.40 | 194.33 | 15.44 | 279.33 | 13.27 | 0.47 | 0.45 | 6.43 | 3.64 | 0.40 |
| RDF+plant protection+PSAP | 7.57 | 0.39 | 0.45 | 191.00 | 15.33 | 298.00 | 13.84 | 0.52 | 0.52 | 6.48 | 4.24 | 0.44 |
| RDF+50 %plant protection | 7.60 | 0.30 | 0.47 | 189.67 | 15.42 | 266.33 | 13.42 | 0.52 | 0.48 | 6.46 | 3.47 | 0.47 |
| RDF+50 %plant protection+PSAP | 7.43 | 0.35 | 0.45 | 196.00 | 14.77 | 296.33 | 12.86 | 0.49 | 0.49 | 5.66 | 3.40 | 0.39 |
| Recomded dose N+50 % P, K & plant protection | 7.47 | 0.34 | 0.45 | 197.33 | 15.11 | 290.33 | 13.66 | 0.50 | 0.51 | 6.30 | 3.80 | 0.43 |
| Recomded dose N+50 % P, K & plant protection+ PSAP | 7.53 | 0.37 | 0.49 | 193.00 | 13.75 | 284.00 | 13.70 | 0.50 | 0.45 | 6.16 | 3.18 | 0.48 |
| Recomded dose N+50 % P, K & 50 %plant protection | 7.50 | 0.32 | 0.48 | 192.33 | 14.02 | 281.67 | 14.11 | 0.47 | 0.51 | 6.46 | 3.93 | 0.45 |
| Recomded dose N+50 % P, K & 50 %plant protection+PASP | 7.47 | 0.34 | 0.43 | 192.67 | 13.36 | 310.67 | 13.56 | 0.47 | 0.46 | 6.50 | 3.73 | 0.48 |
| Recomded dose N+PASP | 7.43 | 0.35 | 0.34 | 193.33 | 13.05 | 268.33 | 13.56 | 0.48 | 0.42 | 5.83 | 3.49 | 0.42 |
| SEm (+) | 0.0562 | 0.0278 | 0.0267 | 2.6183 | 0.2726 | 11.8877 | 0.3971 | 0.0129 | 0.0184 | 0.4956 | 0.1202 | 0.0197 |
| CD at 5% | 0.1684 | 0.0834 | 0.0802 | 7.8496 | 0.8172 | 35.6393 | 1.1906 | 0.0388 | 0.0553 | 1.4859 | 0.3602 | 0.0591 |
| CV | 2.3555 | 24.8898 | 19.1046 | 4.25689 | 5.9194 | 13.0576 | 9.2080 | 8.2731 | 12.1704 | 24.9108 | 10.333 | 14.0306 |



Table 7. Effect of PSAP on cost benefit ratio

| Treatments | Yield | Cost of cultivation | Gross return | Net Return | B:C |
|---|-------|---------------------|--------------|------------|------|
| RDF+plant protection | 22.2 | 32350 | 66600 | 34250 | 1.06 |
| RDF+plant protection+PSAP | 23.34 | 34950 | 70020 | 35070 | 1.00 |
| RDF+50 %plant protection | 18.2 | 30350 | 54600 | 24250 | 0.80 |
| RDF+50 %plant protection+PSAP | 18.52 | 33950 | 55560 | 21610 | 0.64 |
| Recomded dose N+50 % P, K & plant protection | 20.32 | 30950 | 60960 | 31610 | 0.97 |
| Recomded dose N+50 % P, K & plant protection+ PSAP | 20.71 | 32950 | 62130 | 29180 | 0.89 |
| Recomded dose N+50 % P, K & 50 %plant protection | 18.85 | 28350 | 56550 | 28200 | 0.99 |
| Recomded dose N+50 % P, K & 50 %plant protection+PASP | 19.09 | 31950 | 57270 | 25320 | 0.79 |
| Recomded dose N+PASP | 16.48 | 29950 | 49440 | 19490 | 0.65 |

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Dated. 31.5.2019

CERTIFICATE

Certified that the information in the report is based on the bonafied work carried out under contractual research of RVSKVV and the same has been analyzed and interpreted by the concerned scientists. No. part of the research has been utilized for any other purpose.

Title of Project: To study a Bio-efficacy of product PSAP on soybean

Name of funding agency: ISHA Agro Chemical, Pune

Name of Investigator : Dr. A.K. Dixit

Designation : Project In-charge and Principal scientist

Name of Co-Investigators : Dr. Savita Kumari (Programme Assistant)

: Dr. Manish Kumar (Scientist)

Principal Scientist & Head