Effect of Phosphorous, Chloropyriphos and Rhizobium Inoculation on Production and Economics of Chickpea

Abstract

Field experiments were conducted to Studies effect of Phosphorus, Chloropyriphos and Rhizobium inoculants on productivity parameter and economics of chickpea during rabi season of 2020-21 and 2021-22 at students instructional farm, Chandra Shekhar Azad University of Agriculture & Technology, Kanpur. The experiment consists of 18 treatments combinations in factorial randomized block design with three replications consisted of three levels of phosphorous (30, 60 and 90 kg ha^{-1}), three chloropyriphos levels (0, 2.5 and 4.0 ml L^{-1}) and two rhizobium inoculation levels (with rhizobium and without rhizobium). Chickpea variety *RVG-203* was grown with the recommended agronomic practices. On the basis of results emanated from investigation it can be concluded that among the productivity parameters viz. maximum grain yield was 19.76 and 19.88 q ha^{-1} during the both years of experimentation are associated with the treatment T_{15} [60 kg P+ 4.0 ml^{-1} Chloropyriphos with *Rhizobium*]. Similarly stover yield during first year is 25.26 q ha-1 and second year is 25.94 q ha-1 was associated with the treatment T_{15} [60 kg P+ 4.0 ml^{-1} Chloropyriphos with *Rhizobium*]. Maximum gross return Rs 103908 and Rs 110078, net return Rs 66686 and 72232 and benefit cost ratio (B:C ratio) 1.79 and 1.91 during the first year (2020-21) and second year (2021-22) of experimentation were recorded under treatment T_{15} [60 kg P+ 4.0 ml^{-1} Chloropyriphos with *Rhizobium*], but the maximum cost of cultivation during first year is Rs 38734 and second year is Rs 39358 were recorded under treatment T_{18} [90 kg P+ 4.0 ml^{-1} Chloropyriphos with *Rhizobium*].

Key Words: Chickpea, Chloropyriphos, Economics, Phosphorous, Rhizobium and Yield.

Introduction

Pulses are major sources of protein among the vegetarians in India and complement the staple cereals in the diets with protein, essential amino acids, vitamins and minerals. They contain 22-24% protein, which is almost twice the protein in wheat and thrice that of rice **(Shukla *et al.*, 2013).** Chickpea is a very nutritious crop and also has many medicinal properties provide nutritionally balanced food. Chickpea has significant amounts of all the essential amino acids except the sulphur-containing and an affordable source of protein, carbohydrates, minerals and vitamins, dietary fiber, folate, beta-carotene, and health-promoting fatty acids. **(Jukanti *et al.*, 2012).** Chickpea (*Cicer arietinum* L.) is a major legume crop cultivated for its edible seeds legume of the genus *Cicer*, Tribe *Cicereae*, family *Fabaceae* (*leguminaceae*). Chickpea has many local names: hamaz (Arab world), shimbra (Ethiopia), nohud or lablabi (Turkey), chana (India) and garbanzo (Latin America) **(Muehlbauer and Tullu, 1997).** It is originated in south eastern turkey **(Redden *et al.* 2007).** *Rhizobium* symbiosis with legume species is one of special importance, producing 50% of 175 million tons of total BNF annually worldwide. Chickpea and *Rhizobium leguminosarum subsp*. *ciceri* association annually produce upto 176 kg N ha-1 depending on cultivar. India is the largest producer (25% of global production), consumer (27% of world consumption) and importer (14%) of pulses in the world. India ranks first in the world in terms of pulse production (25% of total worlds production) (FAOSTAT 2017). In India chickpea occupies 10.17 million ha area, with a production of 11.35 million tonnes registering the productivity of 1116 kg/ha. In Uttar Pradesh, chickpea crop occupied 0.62 million hectares area, 0.85 million tonnes production and 1371 kg/ha productivity **(Anonymous, 2021).** More than 90 per cent of total pulse production has been the contributed from 10 states and Rajasthan has the highest area (24.21%) under chickpea, followed by Maharashtra (22.82%), Madhya Pradesh (18.94%), Karnataka (10.27%), Uttar Pradesh (6.10%) and Andhra Pradesh (4.56%). **(Anonymous, 2021).** The total world acreage under pulses is about 85.40 (M ha) with production of 87.40 (Mt) at 1023 kg/ha yields level.

Phosphorus is one of the essential nutrients for legume growth and BNF **(Mhango *et al.*, 2008).** Symbiotic nitrogen fixation has a high P demand because the process consumes large amounts of energy **(Schulze *et al.*, 2006)** and energy generating metabolism strongly depends upon the availability of P **(Plaxton, 2004). Singh and Sale (2000)** reported that P fertilization stimulates root growth, photosynthesis and increases hydraulic conductibility of roots. Nitrogen fixing plants have an increased requirement for P over dose receiving direct nitrogen fertilization, probability due to need for nodule development and signal transduction, and to P-lipids in the large number of bacterioids **(Graham and Vance, 2000).** Legumes are heavy feeder of phosphorus and less responsive to nitrogen because of their capacity to meet their own nitrogen requirement through symbiotic fixation **(Kumar *et al.* 2016).** Phosphorus is connected with some plant growth factors that are root development, seed production, earlier and more uniform crop maturity, increase nitrogen fixing capacity of legumes, improvement in crop quality and resistance to plant diseases **(Rehan *et al.* 2018).** Phosphorus is second most critical plant nutrient, but for pulses, it assumes primary importance, owing to its important role in root proliferation and thereby atmospheric nitrogen fixation. Phosphorus is also an important fertilizer in chickpea production; it is a very important chemical fertilizer that can raise the water holding capacity of soil **(Dotaniya *et al.*, 2014)**.

Rhizobium are symbiotic bacteria that facilitate formation of nodules on the roots of legume hosts, within which the bacteria fix atmospheric nitrogen into ammonia. The knowledge of the biodiversity of *Rhizobia* and of local populations is important for the design of successful inoculation strategies **(Lindström *et al.*, 2010).** *Rhizobium* are either indigenous to the soil or inoculated for a particular legume. Adaptability of indigenous *Rhizobium* to their environment results in high levels of saprophytic competence **(Zengeni *et al.*, 2006).** Fields which receive consistent fertility management and legume cropping host higher *Rhizobium* numbers and diversity **(Zengeni *et al.*, 2006).** Soil lacking native rhizobia of chickpea requires artificial seed inoculation for improving root nodulation and yield of the crop **(Khattak *et al.* 2006).**

Pesticides are the important agrochemicals used for prevention of crops from pests. Their use has been largely increased in last few decades. The application of pesticides starts from the pre sowing stage. Different treatments include soil application, seed treatment, foliar spray, etc. Repeated applications of pesticides contaminate the soil **(Sarnaik *et al.*, 2006).**

Chlorpyrifos is an organophosphate insecticide. Pure chlorpyrifos is made up of white or colorless crystals. Chlorpyrifos is used to control many different kinds of pests, including termites, mosquitoes, and roundworms. Chlorpyrifos was first registered as an insecticide in 1965 and the United States Environmental Protection Agency (US EPA) re-registered it in 2006. Chlorpyrifos in the soil may be broken down by ultraviolet light and chemicals in the soil. Soil temperature and pH level may also affect how long chlorpyrifos stays in the soil. Chlorpyrifos will break down more slowly in acidic soils than in basic soils. **(Tomlin *et al.*, 2006).**

Resources and Methods

Experimental Site

The experiment was conducted during *rabi* season of 2020-21 and 2021-22 at student's Instructional farm, C.S.A. University of Agriculture and Technology, Kanpur Nagar (U.P.). The field was well leveled and irrigated by tube well. The farm is situated at main campus of the university, in the west northern part of Kanpur city under sub-tropical zone in v^{th} agroclimatic zone (central plain zone).

Edaphic Condition

The soil was moist, well drained with uniform plane topography. The soil of the experimental field was alluvial in origin, sandy loam in texture and slightly alkaline in reaction having pH 7.97 and 7.92 (1:2.5 soil: water suspension method given by **Jackson, 1973**), electrical conductivity 0.36 and 0.35 dSm^{-1} (1:2.5 soil: water suspension method given by **Jackson, 1973**), Organic carbon percentage in soil is 0.35 and 0.35 per cent (Walkley and Black's rapid titration method given by **Walkley and Black, 1934**), with available nitrogen 197.25 and 198.42 kg ha^{-1} (Alkaline permanganate method given by **Subbiah and Asija, 1956**), available phosphorus as sodium bicarbonate-extractable P was 12.14 and 12.21 kg ha^{-1} (Olsen's calorimetrically method**, Olsen *et al.*, 1954**) available potassium was 265.15 and 266.68 kg ha^{-1} (Flame photometer method given by **Hanwey and Heidel, 1952**)

Table No. 1: Analytical data of the experimental soil (pre-sowing)

S. No.	Soil characters	Value	
		2020-21	**2021-22**
1.	Texture	Sandy loam	Sandy loam
2.	pH (1:2.5 soil water suspension)	7.97	7.92
3.	EC (dsm^{-1}) (1:2.5 soil water suspension)	0.36	0.35
4.	Organic carbon (%)	0.35	0.35
5.	Available N kg ha^{-1}	197.25	198.42
6.	Available P kg ha^{-1}	12.14	12.21
7.	Available K kg ha^{-1}	265.15	266.68

Detail of treatments and design

The 18 treatments combination of nutrient management practices having three each phosphorus levels (30, 60 and 90 kg ha^{-1}) and Chlorpyriphos (20 EC) levels (0, 2.5, 4.0 ml L^{-1}) along with and without seed inoculation of Rhizobium. Experiment was laid out in Factorial Randomized Block Design with three replications.

Table -2: detail of the treatment combinations:

S. No.	Treatment Details	Symbol
1.	**30 kg P+ 0 ml L^{-1} Chloropyriphos without *Rhizobium***	P_{30} I_0 Rh_0
2.	**30 kg P+ 2.5 ml L^{-1} Chloropyriphos without *Rhizobium***	P_{30} I_1 Rh_0
3.	**30 kg P+ 4.0 ml L^{-1} Chloropyriphos without *Rhizobium***	P_{30} I_2 Rh_0
4.	**60 kg P+ 0 ml L^{-1} Chloropyriphos without *Rhizobium***	P_{60} I_0 Rh_0
5.	**60 kg P+ 2.5 ml L^{-1} Chloropyriphos without *Rhizobium***	P_{60} I_1 Rh_0
6.	**60 kg P+ 4.0 ml L^{-1} Chloropyriphos without *Rhizobium***	P_{60} I_2 Rh_0
7.	**90 kg P+ 0 ml L^{-1} Chloropyriphos without *Rhizobium***	P_{90} I_0 Rh_0
8.	**90 kg P+ 2.5 ml L^{-1} Chloropyriphos without *Rhizobium***	P_{90} I_1 Rh_0
9.	**90 kg P+ 4.0 ml L^{-1} Chloropyriphos without *Rhizobium***	P_{90} I_2 Rh_0
10.	**30 kg P+ 0 ml L^{-1} Chloropyriphos with *Rhizobium***	P_{30} I_0 Rh_1
11.	**30 kg P+ 2.5 ml L^{-1} Chloropyriphos with *Rhizobium***	P_{30} I_1 Rh_1
12.	**30 kg P+ 4.0 ml L^{-1} Chloropyriphos with *Rhizobium***	P_{30} I_2 Rh_1
13.	**60 kg P+ 0 ml L^{-1} Chloropyriphos with *Rhizobium***	P_{60} I_0 Rh_1
14.	**60 kg P+ 2.5 ml L^{-1} Chloropyriphos with *Rhizobium***	P_{60} I_1 Rh_1
15.	**60 kg P+ 4.0 ml L^{-1} Chloropyriphos with *Rhizobium***	P_{60} I_2 Rh_1
16.	**90 kg P+ 0 ml L^{-1} Chloropyriphos with *Rhizobium***	P_{90} I_0 Rh_1
17.	**90 kg P+ 2.5 ml L^{-1} Chloropyriphos with *Rhizobium***	P_{90} I_1 Rh_1
18.	**90 kg P+ 4.0 ml L^{-1} Chloropyriphos with *Rhizobium***	P_{90} I_2 Rh_1

Crop Husbandry

A pre-sowing irrigation (Paleva) was done in the experimental field with an object to get optimum moisture conditions for attaining good germination. At proper tilth, one ploughing with tractor drawn mould bold plough was done followed by two ploughings by cultivator. Nitrogen @ 20 kg ha^{-1} and potash @ 40 kg ha^{-1} applied uniformly through urea and murate of potash respectively. Phosphorus was apply as per treatment in the furrows, 5 cm below the seed at the time of sowing through single super phosphate. Chloropyriphos was sprayed before flowering as per treatment. Inoculation was done by soaking the surface sterilized seeds of chickpea (*Cicer. arietinum* L.) in the liquid culture medium for 1 h. Just before sowing sticker solution and culture suspension were taken in a 1000 ml beaker and mix thoroughly then healthy and bold seeds of chickpea were mixed with *Rhizobium* strains. The sowing of chickpea crop was done using a seed rate of 80 kg ha^{-1} in furrows opened by plough in the furrows spaced at 45 cm apart. Planking was done to cover the seeds with fine soil after sowing.

Harvesting and threshing: the crop was harvested at maturity and was allowed to dry in sun. Separate bundles were made for each plot and weighted. The after drying harvest was threshed manually.

Grain yield

After threshing the grain yield from each plot was separately weighed and recorded after converting into quintals per hectare.

Stover yield

After subtracting the grain yield per plot from the total biological yield. After converting the yields into quintals per hectare, yields were recorded.

Economics:

The economics of different treatments was worked out on the basis of average yield (seed and stover) of 2020-21 and 2021-22.

(Cost of cultivation:

The cost of cultivation was worked out on the basis of input rates at the farm. Treatments cost was calculated separately. The common cost of cultivation (₹ ha^{-1}) was worked out by considering all the expenses incurred in the cultivation and added variable cost due to treatments (including interest of working capital) in order to get total cost of cultivation.

Gross return (₹ ha^{-1}):

It was calculated by taking the income from the grain and straw produced on the basis of market rates. The yield of chickpea crop was converted into gross return in rupees per hectare on the basis of current price of the produce

$$\textbf{Gross return } (₹\ \textbf{ha}^{-1}) = \textbf{Total income from grain and stover yield}$$

Net return (₹ ha^{-1})

Net profit is the outcome received by subtracting the cost of cultivation from gross income (₹ ha^{-1}). The net return was worked out by using following formula-

Net return (₹ ha^{-1}) = Gross return (₹ ha^{-1}) - Cost of cultivation (₹ ha^{-1})

Benefit Cost ratio (B:C)

Net income of each treatment was divided by cultivation cost of respective treatment and cost benefit ratio was recorded. There was calculated with the help of following formula.

$$\textbf{\textit{Benefit}}:\textbf{\textit{cost ratio}} = \frac{\textbf{\textit{Net Return}}\ (₹\ \textbf{\textit{ha}}^{-1})}{\textbf{\textit{Cost of cultivation}}\ (₹\ \textbf{\textit{ha}}^{-1})}$$

Statistical analysis: The growth parameters and yields were recorded and analyzed as per Gomez and Gomez (1984) the tested at 5% level of significance to interpret the significant differences.

Result and Discussion

Productivity Parameters

It is visualized from the data given in Table-3 and depicted in clearly indicate that among the productivity parameters viz. grain yield (q ha^{-1}) and stover yield (q ha^{-1}) significantly increase due to the application of phosphorous, chloropyriphos and rhizobium inoculation. Grain yield varied from 12.42 to 19.82 q ha^{-1} and stover yield varied from 17.95 to 25.60 q ha^{-1} on pooled basis. The maximum grain yield (19.88 q ha^{-1}) and stover yield (25.94 q ha^{-1}) was recorded in the treatment T_{15} [60 kg P+ 4.0 ml L^{-1} Chloropyriphos with *Rhizobium*] during the second year (2021-22) of experimentation. The minimum grain yield (12.25 q ha^{-1}) and stover was recorded in the treatment T_1 [30 kg P+ 0 ml L^{-1} Chloropyriphos without *Rhizobium*] during the first year (2020-21) of experimentation. The surge in seed and stover yields under adequate nutrients supply might be attributed to mainly to the collective effect of a greater number of pods $plant^{-1}$, grains pod^{-1} and higher test weight, which was the result of improved translocation of photosynthates from source to sink ultimately yield is increased. The increase in grain yield under adequate nutrients supply mainly due to more yield attributes ultimately resulted more grain yield. Grain, stover and biological yield of chickpea significantly increased due to phosphorus (60 kg P_2O_5 ha^{-1}) and chloropyriphos (4.0 ml L^{-1}) over their controls. Inoculation of rhizobium further increased grain & stover yield of chickpea significantly over without inoculation. Combine use of phosphorus 60 kg P_2O_5 ha^{-1} and chloropyriphos 4.0 ml L^{-1} alone with rhizobium significantly increased grain 19.88 q ha^{-1} and stover 25.94 q ha^{-1} of chickpea recorded under T_{15} [60 kg P+ 4.0 ml L^{-1} Chloropyriphos with *Rhizobium*] over other treatments during second year. It may due to rhizobium which fix atmospheric nitrogen and increased the supply of other nutrients to plants and ultimately increased grain and stover yield of chickpea. These results also confirms the findings of **Panigrahi (2010)**, **Sharma (2012), Kumar *et al.* (2016), Ullah *et al.* (2018), Kumar *et al.* (2019), Suryavanshi *et al.* (2020), Singh *et al.* (2022) Patel *et al.* (2022) and Yadav *et al.* (2022)**

Economics

Economic viability is a function of gain or loss. Any practice in order to be economical viable must have a substantial balance over its cost. In order to assured profitability net return and B: C ratio was worked out. While we study the economics of the chickpea cultivation during the both years of experimentation, it can be concluded that all the economics parameters such as gross return, net return and benefit cost ratio except cost of cultivation were significantly affected by the application of phosphorous, rhizobium and chloropyriphos. The data extracted from the Table 4 and Table 5 it can be resulted that the maximum gross return (₹ 110078) was recorded in the treatment T_{15} [60 kg P+ 4.0 ml L^{-1} Chloropyriphos with *Rhizobium*] during the second year (2021-22) of experimentation. The minimum gross return (₹ 65071) was recorded in the treatment T_1 [30 kg P+ 0 ml L^{-1} Chloropyriphos without *Rhizobium*] during the first year (2020-21) of experimentation. Maximum net return (₹ 72232) was recorded in the treatment T_{15} [60 kg P+ 4.0 ml L^{-1} Chloropyriphos with *Rhizobium*] during the second year (2021-22) of experimentation. The minimum net return (₹ 30889) was recorded in the treatment T_1 [30 kg P+ 0 ml L^{-1} Chloropyriphos without *Rhizobium*] during the first year (2020-21) of experimentation. Similarly, Maximum B:C ratio (1.91) was recorded in the treatment T_{15} [60 kg P+ 4.0 ml L^{-1} Chloropyriphos with *Rhizobium*] during the second year (2021-22) of experimentation. The minimum B:C ratio (0.90) was recorded in the treatment T_1 [30 kg P+ 0 ml L^{-1} Chloropyriphos without *Rhizobium*] during the first year (2020-21) of experimentation. While, in case of cost of cultivation it can concluded that the maximum cost of cultivation (₹ 39358) was found in the treatment T_{18} [90 kg P+ 4.0 ml L^{-1} Chloropyriphos with *Rhizobium*] during the second year of experimentation and minimum cost of cultivation was recorded in the treatment T_1 [30 kg P+ 0 ml L^{-1} Chloropyriphos without *Rhizobium*] during the first year (2020-21) of experimentation. If it is economically viable in modern farming maximum profit is more important than maximum profit the real comparison of different treatment can only judge on the basis of economic viability. The cost and gross return varied markedly due different levels of phosphorous and chloropyriphos along with seed treatment with rhizobium which ultimately influence the net return and B:C ratio. The consequences of the current investigation are additionally in concurrence with the investigation of **Jain *et al.* (2006), Kushwaha (2007), Prasad *et al.* (2008), Shivran and Prakash (2012), Yadav *et al.* (2013), Kumawat *et al.* (2020), Yadav *et al.* (2021), Patel *et al.* (2022) and Yadav *et al.* (2022)**

Conclusion

The study showed that the application of phosphorous, chloropyriphos and rhizobium resulted in higher grain yield of chickpea as well as higher net returns and B:C ratio; thus, it will help in uplifting the socioeconomic status of the farmers. Application of phosphorous, chloropyriphos and rhizobium inoculation deserves a special attention for increasing productivity and profitability of chickpea.

Table-3: Effect of different treatment combinations on productivity parameters of chickpea

Treatments	Grain Yield (q ha^{-1})			Stover Yield (q ha^{-1})		
	2020-21	**2021-22**	**Pooled**	**2020-21**	**2021-22**	**Pooled**
T_1	12.25	12.58	12.42	17.84	18.06	17.95
T_2	13.44	13.86	13.65	18.56	18.84	18.70
T_3	13.92	14.12	14.02	19.42	19.67	19.55
T_4	15.56	15.70	15.63	20.46	20.63	20.55
T_5	16.65	16.81	16.73	22.49	22.69	22.59
T_6	17.72	17.85	17.79	23.42	23.71	23.57
T_7	14.42	14.61	14.52	19.54	19.72	19.63
T_8	15.53	15.94	15.74	21.89	22.14	22.02
T_9	16.68	16.89	16.79	22.59	22.89	22.74
T_{10}	13.46	13.55	13.51	19.45	20.32	19.89
T_{11}	14.38	14.67	14.53	20.67	20.67	20.67
T_{12}	15.10	15.84	15.47	21.52	21.56	21.54
T_{13}	16.68	16.76	16.72	22.81	22.79	22.80
T_{14}	17.87	17.96	17.92	24.68	24.38	24.53
T_{15}	19.76	19.88	19.82	25.26	25.94	25.60
T_{16}	16.21	16.49	16.35	21.86	21.62	21.74
T_{17}	17.68	17.89	17.79	23.19	24.26	23.73
T_{18}	18.94	19.01	18.98	24.72	24.18	24.45
S.Ed±	P 0.56 I 0.56 Rh 0.46	P 0.62 I 0.62 Rh 0.52	P 0.41 I 0.41 Rh 0.33	P 0.70 I 0.70 Rh 0.58	P 0.90 I 0.90 Rh 0.73	P 0.55 I 0.55 Rh 0.44
C.D. at 5 %	P 1.13 I 1.13 Rh 0.93	P 1.25 I 1.25 Rh 1.05	P 0.83 I 0.83 Rh 0.68	P 1.41 I 1.41 Rh 1.17	P 1.81 I 1.81 Rh 1.47	P 1.12 I 1.12 Rh 0.89

Table-4: Economic study of chickpea as affected by different treatment combinations

Treatment	Treatment Combinations	Cost of cultivation (₹/ ha)			Gross return (₹/ ha)		
		2020-21	2021-22	Pooled	2020-21	2021-22	Pooled
T_1	P_{30} I_0 Rh_0	34182	34806	34494	65071	71270	68171
T_2	P_{30} I_1 Rh_0	35047	35671	35359	71088	77920	74504
T_3	P_{30} I_2 Rh_0	35566	36190	35878	73686	79558	76622
T_4	P_{60} I_0 Rh_0	35678	36302	35990	81993	88046	85020
T_5	P_{60} I_1 Rh_0	36543	37167	36855	87916	94264	91090
T_6	P_{60} I_2 Rh_0	37062	37686	37374	93411	100114	96763
T_7	P_{90} I_0 Rh_0	37190	37814	37502	76160	82078	79119
T_8	P_{90} I_1 Rh_0	38055	38679	38367	82276	89785	86031
T_9	P_{90} I_2 Rh_0	38574	39198	38886	88092	94602	91347
T_{10}	P_{30} I_0 Rh_1	34342	34966	34654	71453	75821	73637
T_{11}	P_{30} I_1 Rh_1	35207	35831	35519	76304	81733	79019
T_{12}	P_{30} I_2 Rh_1	35726	36350	36038	80069	88001	84035
T_{13}	P_{60} I_0 Rh_1	35838	36462	36150	88158	93074	90616
T_{14}	P_{60} I_1 Rh_1	36703	37327	37015	94520	99835	97178
T_{15}	P_{60} I_2 Rh_1	37222	37846	37534	103908	110078	106993
T_{16}	P_{90} I_0 Rh_1	37350	37974	37662	85582	91333	88458
T_{17}	P_{90} I_1 Rh_1	38215	38839	38527	93147	99359	96253
T_{18}	P_{90} I_2 Rh_1	38734	39358	39046	99749	105190	102470

Table-5: Economic study of chickpea as affected by different treatment combinations

Treatments	Treatments Combinations	Net return (₹/ ha)			B:C ratio		
		2020-21	2021-22	Pooled	2020-21	2021-22	Pooled
T_1	$P_{30}\ I_0\ Rh_0$	30889	36464	33677	0.90	1.05	0.98
T_2	$P_{30}\ I_1\ Rh_0$	36041	42249	39145	1.03	1.18	1.11
T_3	$P_{30}\ I_2\ Rh_0$	38120	43368	40744	1.07	1.20	1.14
T_4	$P_{60}\ I_0\ Rh_0$	46315	51744	49030	1.30	1.43	1.37
T_5	$P_{60}\ I_1\ Rh_0$	51373	57097	54235	1.41	1.54	1.48
T_6	$P_{60}\ I_2\ Rh_0$	56349	62428	59389	1.52	1.66	1.59
T_7	$P_{90}\ I_0\ Rh_0$	38970	44264	41617	1.05	1.17	1.11
T_8	$P_{90}\ I_1\ Rh_0$	44221	51106	47664	1.16	1.32	1.24
T_9	$P_{90}\ I_2\ Rh_0$	49518	55404	52461	1.28	1.41	1.35
T_{10}	$P_{30}\ I_0\ Rh_1$	37111	40855	38983	1.08	1.17	1.13
T_{11}	$P_{30}\ I_1\ Rh_1$	41097	45902	43500	1.17	1.28	1.23
T_{12}	$P_{30}\ I_2\ Rh_1$	44343	51651	47997	1.24	1.42	1.33
T_{13}	$P_{60}\ I_0\ Rh_1$	52320	56612	54466	1.46	1.55	1.51
T_{14}	$P_{60}\ I_1\ Rh_1$	57817	62508	60163	1.58	1.67	1.63
T_{15}	$P_{60}\ I_2\ Rh_1$	66686	72232	69459	1.79	1.91	1.85
T_{16}	$P_{90}\ I_0\ Rh_1$	48232	53359	50796	1.29	1.41	1.35
T_{17}	$P_{90}\ I_1\ Rh_1$	54932	60520	57726	1.44	1.56	1.50
T_{18}	$P_{90}\ I_2\ Rh_1$	61015	65832	63424	1.58	1.67	1.63

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