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Demonstration of Dicoccum wheat variety DDK-1029 under Northern dry zone of Karnataka

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Abstract
The present study on demonstration of dicoccum wheat variety DDK-1029 under northern dry zone of Karnataka, India was conducted at ICAR-Krishi Vigyan Kendra, Vijayapura-II (Indi). The dicoccum wheat variety DDK-1029 with package of practice, which was developed by University of Agricultural Sciences, Dharwad was used. The study was conducted in 30 demonstrations in 12 ha of farmer's field in different villages of Indi, Chadchan, Devara Hipparagi and Sindagi Taluks of Vijayapura district for three years (2019-20 to 2021-22). The productivity of dicoccum wheat ranged from 29.80 to 33.50 q/ha with mean yield of 29.42 q/ha under demonstration field as against a yield ranged from 22.20 to 28.30 q/ha with a mean of 24.73 q/ha recorded under farmers practice. In comparison to farmers practice 19.00% higher productivity was observed in demonstrated field. The dicoccum wheat variety DDK-1029 with improved package of practice recorded higher gross returns (Rs. 93,660/ha), net return (Rs. 72,460/ha) and B:C ratio (4.41) as compared to farmers practice. Further by inclusion of dicoccum wheat variety DDK-1029 with improved package of practice realized an additional income of Rs. 13,212 per hectare, which created awareness and motivated the other farmers to adopt.

Keywords: Dicoccum wheat, yield, extension gap, technology gap, frontline demonstration and economics

Introduction
One of the most important winter food crops of India is wheat and its productivity has played a key role in making the country self-sufficient in food grain. It is the crop which triggered green revolution in India. It is estimated that more than 35 percent of world population depends on wheat. It supplies the daily protein requirement of human diet up to 60 percent, than any other crop. In India, wheat is the second most important food crop next to rice and it contributes nearly 35 percent to national food basket. Among food crops, it contributes about 35.81 percent of the food grain. During the crop year 2021-22, wheat was grown over an area 29.80 million hectare with the total production of 108.84 million tones and a productivity of 3300 kg per hectare which shares 12.43% of total production in the world (Anon, 2022) [2]. Delayed sowing of wheat (December or early January) causing poor seed yield, due to sub-optimal temperature at sowing, which causes delayed in germination, slow growth and development phase (Tiwari *et al*., 2015) [6]. Further, delayed in sowing causes supra optimal thermal stress during reproductive phases which results in forced maturity. The poor agronomic management practices such as seed rate, location specific improved variety, nutrient and irrigation management so on are responsible for low productivity of wheat in India in general and Karnataka in particular.
Among the wheat, dicoccum wheat cultivation is unique in peninsular zone. It is nutritionally rich because of presence of higher protein content, more dietary fiber, resistant starch and high therapeutic value. The food prepared out of this wheat has high satiety value, unique flavor and good keeping quality. The dicoccum wheat growing farmers predominantly cultivated local types. This necessitated the development of high yielding dicoccum wheat varieties. To improve the yield potential and lodging tolerance, semi dwarf variety DDK 1029 was developed. Vijayapura district has a substantiate area under dicoccum wheat which is grown under irrigation. Dicoccum wheat is known for its nutraceutical value of regulating blood glucose level, dicoccum wheat is one of the major rabi/winter cereal crop of Vijayapura district.

The present study was taken with the following objectives

- To study the difference between technology introduced with local farmers practice in terms of extension gap, technology gap and technology index.
- To compare the yield and economics of demonstrated plots with farmers practice.

Materials and Methods

The present study was conducted at ICAR-Krishi Vigyan Kendra, Vijayapura-II (India), Karnataka in an operational area of KVK, for three years (2019-20 to 2021-22) the information on existing cultivation practices by the farmers were collected during pre-season by interacting. The information comprises of variety used, yield, profit and problem faced by the farmers. Based on the collected information, technological gaps were identified and a suitable package of practice were prepared and introduced in the demonstration. The farmers having irrigation facility were selected for the study by adopting the University of Agricultural Sciences, Dharwad package of practice (Table 1).

There are number of dicoccum wheat varieties were developed by University of Agricultural Sciences, Dharwad. ICAR-Krishi Vigyan Kendra, Vijayapura-II (Indi) being a ToT centre under the aegis of UAS, Dharwad involved in disseminating technologies suitable to meet the needs of farmers of this region. Dicoccum wheat variety (DDK-1029) which is evolved as superior over local variety was assessed for its performance in Vijayapura district during 2019-20, 2020-21 and 2021-22.

Dicoccum wheat variety DDK-1029 is most suitable for timely sown irrigated condition of peninsular and central zone. It is semi-dwarf in nature; tolerant to lodging, it is high yielding by early maturing as compared to local types. It is best suitable both for chapati and macaroni preparation. It has low glyceamic index and hence most suitable for diabetic patients. It matures in 100 to 105 days, it resistance to insect pests and major diseases, tolerance to heat stress, excellent grain quality, nutritional and therapeutic value. It is suitable for Semolina, Chapati, Dhalia, Macaroni and Pasta products (Anon., 2020) [1].

The farmers which are growing dicoccum wheat were purposively selected based on their willingness to participate in the demonstration, whose fields are located near main road. The study was carried by taking 0.4 ha unit area from each farmer and total 4 ha field with 10 farmers in each year; total 30 demonstration in 12 ha of farmers field in different villages of Indi, Chadchan, Devara Hipparagi and Sindagi taluks of Vijayapura district for three years. For the comparison between demonstration and farmers practice, other field grown by the same farmer or different farmer adjoining to the demonstration field were used. For each year farmers have been trained for adopting improved package of practice by conducting on and off campus trainings.

The certified seeds of dicoccum wheat variety DDK-1029 were purchased from the Seed Unit, University of Agricultural Sciences, Dharwad. Seed as the critical input @ 60 kg/ha were provided to the participating farmers. For seed treatment Azospirillum were purchased from Institute of Organic Farming, University of Agricultural Sciences, Dharwad and remaining inputs were purchased from the local market. The expenditure on recommended fertilizers and plant protection measures were borne by them. The data on cost of cultivation, yield were collected from each selected framer as well as from non-practicing farmer. For calculation of economics, price of the produce has been collected from Agricultural Produce Marker Committee (APMC), Indi, Vijayapura. From the collected data yield, cost of cultivation, gross returns, net profit and B:C ratio were worked out. The extension gap, technology gap and technology index were estimated (Samui *et al*., 2000) [4] by the following formulae and final conclusions were drawn.

1. Extension gap = Demonstration yield – Farmers yield
2. Technology gap = Potential yield – Demonstration yield
3. Technology index = [(Potential yield – Demonstration yield)/ Potential yield] X 100

Results and Discussion

Yield

The yield obtained over the years under recommended and farmers practice are presented in table 2. The productivity of dicoccum wheat ranged from 28.70 to 32.20 q/ha with mean yield of 29.42q/ha under demonstration field as against a yield ranged from 24.15 to 26.45 q/ha with a mean of 24.72 q/ha recorded under farmers practice. In comparison to farmers practice there was an increase of 18.84, 19.17 and 17.85% higher productivity, respectively during 2019-20, 2020-21 and 2021-22 following demonstration field. The higher yield of dicoccum wheat under demonstration field was due to the use of latest and improved high yielding variety and with its recommended cultivation practice. These results are same with the findings of Tiwari *et al*. (2015) [6]

Extension gap

An extension gap between demonstrated field and farmers practices was worked out and it ranges from 4.55 to 5.75 q/ha with an average of 4.70 q/ha during three year study period (Table 2). This indicates that, farmers need to be educated for the adoption of improved technology with high yielding varieties through various extension activities to reverse the wider and alarming trend of galloping extension gap.

Technology gap

The difference between potential yield and demonstrated yield was explained as technology gap. The data on technology gap was ranged from 31.30 to 27.80 q/ha with an average of 30.58 q/ha (Table 2). This may be due variation in fertility and weather conditions of the area. To narrow down the technology gap, location specific recommendation appears to be necessary. These results are in line with the findings of Hiremath and Nagaraju (2009) [3].

Technology index

Feasibility of the improved technology at the farmer's field was indicated by technology index, lower the index higher will be the feasibility of improved technology. In this study lower technology index (46.33) was observed in 2021-22, which was followed by 49.75 and 52.17 percent in 2020-21 and 2019-2020, respectively (Table 2). During 2021-22 lower technology index was appeared, this may be due to dicoccum wheat variety DDK-1029 performed well with improved technology in an area of higher soil fertility which was coupled with good weather condition. These results are similar to the findings of Hiremath and Nagaraju (2009) [3].

Economics

The economics of the demonstration technology and farmers practice were worked out for every demonstrating year in this study which was presented in Table 3. The data on economic analysis over the year revealed the dicoccum wheat variety DDK-1029 with improved package of practice recorded higher gross returns (Rs. 93,660/ha), net return (Rs. 72,460/ha) and B:C ratio 4.41) as compared to farmers practice. Further by inclusion

of dicoccum wheat variety DDK-1029 with improved package of practice realized an additional income of Rs. 13,212 per hectare. The results revealed that higher profitability and economic viability of dicoccum wheat variety DDK-1029 with improved package of practice under local agro-ecological situation (Suma *et al*., 2022) [5].

Table 1: Comparison of technology intervention and farmers practice under dicoccum wheat frontline demonstration

Sl.no.	Particulars	Frontline demonstration	Farmers practice	Gap
1	Variety	DDK-1029	Local	Full gap
2	Seed rate (kg/ha)	150	200	Partial gap
3	Seed treatment	*Azospirilum*	No	Full gap
4	Sowing method	Seed cum fertilizer drill	Seed drill	Partial gap
5	Spacing	23 cm row spacing	45 cm row spacing	Partial gap
6	Depth of sowing	5 cm	Deep sowing (more than 5cm)	Full gap
7	Sowing date	October 2nd fortnight to December 1st fortnight	November 2nd fortnight to December 2nd fortnight	Partial gap
8	Fertilizer application	30:30:20 kg NPK/ha as basal dose and 30 N kg/ha after 30 days after sowing	DAP: 125 kg/ha and urea: 125 kg/ha	Partial gap
9	Weed control	Pre-emergent application of Pendimethalin 30 EC@ 3.25l/ha and one intercultivation	Two intercultivation and one hand weeding	Partial gap
10	Number of irrigation	06	08	Partial gap
11	Plant protection	Based on recommended dose (as per package of practices)	Over dose and different brands of pesticides	Partial gap

Table 2: Yield and yield gap analysis of frontline demonstration and farmers practice

Year	No. of Demos	Area (ha)	Potential yield (q/ha)	Yield		% Increase	Extension gap (q/ha)	Technological gap (q/ha)	Technology Index (%)
				Demo	FP				
2019-20	10	4	60	28.70	24.15	18.84	4.55	31.30	52.17
2020-21	10	4	60	30.15	25.30	19.17	4.85	29.85	49.75
2021-22	10	4	60	32.20	26.45	17.85	5.75	27.80	46.33
mean	10	4	60	29.42	24.72	19.00	4.70	30.58	50.97

FP: Farmers practices

Table 3: Economics of dicoccum wheat in technology intervention and farmers practice under frontline demonstration

Year	Cost of cultivation (Rs./ha)		Gross returns (Rs./ha)		Net returns (Rs./ha)		Additional income (Rs./ha)	B:C ratio	
	Demo	FP	Demo	FP	Demo	FP		Demo	FP
2019-20	18,750	17,940	81,795	71,243	63,045	52,795	10,250	4.36	3.97
2020-21	23,650	22,850	1,05,525	88,550	81,875	65,700	16,175	4.46	3.88
2021-22	30,560	28,740	1,15,920	95,220	85,360	66,480	18,880	3.79	3.31
Mean	21,200	20,395	93,660	79,897	72,460	59,248	13,212	4.41	3.93

FP: Farmers practices

Conclusion

From the study it can be concluded that, yield of dioccum wheat variety DDK-1029 with improved technology was increased by 19.00 percent (Average of three years) over the farmer practice with an additional income of Rs. 13,212 per hectare, which created awareness and motivated the other farmers to adopt. The beneficiary farmers of the frontline demonstration also play an important role as a source of information for wider dissemination of high yielding dioccum wheat to nearby farmers. Thus, the frontline demonstration is an effective tool for increasing area, production and productivity of dicoccum wheat by changing the knowledge, skill and attitude of the farmers on the adoption of improved technologies.

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