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Study on market potential of plant growth regulators in Amravati District

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Abstract
This study assessed the market potential of Plant Growth Regulators (PGRs) in Amravati district, Maharashtra, focusing on farmer and retailer perspectives, conducted in Chandur Bazar and Morshi tehsils with 60 farmers and 20 retailers. It explored awareness, adoption, and key challenges. PGRs play a crucial role in improving crop productivity by regulating plant processes like germination, flowering, and fruiting. While awareness and adoption were moderately high, farmers lacked knowledge on dosage, timing, and specific product use. Major constraints included high prices, limited finance, and technical gaps. Retailers faced high competition, inadequate promotion, and credit issues. Despite these challenges, the study highlights strong market potential, recommending awareness drives, technical training, and improved market linkages for sustainable growth.

Keywords: Plant growth regulators, awareness, adoption, market potential, constraints, Amravati

Introduction
India is primarily an agricultural nation, with 65-70per cent of the population dependent on farming. With about 140 million hectares under cultivation, agriculture plays a vital role in the rural economy and national GDP. However, regions like Vidarbha in Maharashtra face challenges such as erratic rainfall, declining soil fertility, pest issues, and low productivity. To address these, enhancing crop quality and yield sustainably is essential.

While fertilizers and pesticides help with nutrition and protection, they often fall short in overcoming plant physiological limitations. In this context, Plant Growth Regulators (PGRs) organic compounds that influence plant processes like germination, flowering, fruiting, and stress tolerance have become increasingly important. When applied correctly, plant growth regulators can significantly improve yield and crop quality. India's agrochemical industry is among the fastest-growing globally, with the PGR segment valued at over ₹5,000 crore as of 2024. Rising demand for high-value crops and climate resilience is driving this growth. Yet, adoption remains limited due to lack of awareness, technical knowledge, high costs, and weak promotional strategies.

Amravati district, a key agricultural zone in Vidarbha, cultivates crops like cotton, soybean, bengal gram, oranges, and vegetables. However, traditional practices dominate, and PGR usage remains low due to limited knowledge among farmers and inadequate support for retailers. While some farmers have seen success with PGRs, widespread adoption is hindered by information gaps and marketing challenges. Thus assessing the market potential, awareness, and constraints of PGR use in Amravati is crucial for promoting sustainable agriculture and guiding policy, industry, and extension efforts.

Objectives
1. To measure the market potential and market share of plant growth regulators.
2. To study the awareness and adoption of plant growth regulators among the farmers.
3. To identify constraints faced by farmers and retailers with respect to plant growth regulators.

Methodology
The present study was conducted to assess the market potential of Plant Growth Regulators (PGRs) in Amravati district of Maharashtra. The methodology includes details on the area of

study, sampling technique, data sources, and analytical tools used to achieve the study objectives. Amravati district was purposively selected as the area of study, and the research was carried out during the period 2024-2025. Two tehsils from the district namely Chandur Bazar and Morshi were selected for data collection. From each tehsil, three villages were chosen, and from each village, 10 farmers were randomly selected, resulting in a total sample size of 60 farmers. Additionally, 10 retailers were selected from each tehsil, making a total of 20 retailers. Primary data were collected using a well-structured schedule prepared specifically for farmers and retailers.

Analytical tools

Market potential is calculated by formula,

Market potential = Average use of PGRs × Total cultivated area under (Whole district) the crop of whole district

$$\text{Average use of PGR} = \frac{\text{Total consumption of the PGRs}}{\text{Total area of particular crop production}}$$

For analyzing the market share percentage method is used.

For Awareness and adoption about plant growth regulators among farmers and constraints faced by farmers and retailers for purchasing and selling of plant growth regulators is analyzed by simple tabular analysis.

Result and Discussion

The results of the present study are presented as below. The results are arranged as per the objectives taken.

Market potential of plant growth regulators

The table 1 shows the average use of Plant Growth Regulators (PGRs) across five major crops cotton, soybean, bengal gram, orange, and vegetables, based on the data.

Table 1: Average use of plant growth regulators

Crop	Total consumption of the plant growth regulators (lit)	Total area under crop cultivation (ha)	Average use of plant growth regulators and total cultivated area (lit/ha)
Cotton	14.20	38.04	0.37
Soybean	16.20	41.68	0.39
Bengal gram	07.00	20.64	0.34
Orange	29.50	38.45	0.77
Vegetable	03.50	09.71	0.36
Total	70.40	148.52	2.23

Among these, orange cultivation showed the highest PGR consumption at 29.5 liters over 38.45 hectares, with an average usage of 0.77 lit /ha, which indicates a relatively higher adoption and usage of PGRs in orange farming. Soybean and cotton followed with 16.20 liters and 14.20 liters of total PGR consumption, respectively. The average dose was 0.39 lit/ha for soybean and 0.37 lit/ha for cotton, showing moderate levels of PGR application in these crops. Bengal gram had a lower overall consumption of 7.00 liters across 20.64 hectares, with an average usage of 0.34 lit/ha, indicating limited usage. Similarly, vegetables accounted for the least PGR consumption, with only 3.50 liters used over 9.71 hectares, averaging 0.36 lit/ha.

Table 2: Market potential of Plant Growth Regulators for cultivated area under the selected crops of Amravati district

Crop	Total cultivated area under the particular crop of Amravati district (ha)			Average of total cultivated area (ha)	Average use of PGRs (lit/ha)	Market potential (liter)
	2020-21	2021 -22	2022-23			
Cotton	210100	217200	221207	216169	0.37	80690
Soybean	241800	252000	252221	248478	0.39	96687
Bengal gram	96891	91200	97880	95324	0.34	32329
Orange	69589	70100	70560	70083	0.77	53775
Vegetable	2512	2611	26500	10541	0.36	3798
Total	533682	633111	668368	640900	2.23	267279

Tabe 2 estimated that the market potential for Plant Growth Regulators (PGRs) in Amravati district, it is essential to examine the total cultivated area under major crops and their average PGR usage per hectare. The market potential of PGRs depends significantly on the extent of crop cultivation and the intensity of PGR application. In this study, five key crops cotton, soybean, bengal gram, orange, and vegetables were analyzed over a three year period (2020-21 to 2022-23) to determine their average cultivated area and corresponding PGR usage. Among the crops, soybean has the highest average cultivated area of 248,478 hectares, with an average PGR usage of 0.39 liters per hectare, resulting in a market potential of 96,687 liters. Cotton follows with 216,169 hectares average area and 0.37 liters per hectare usage, leading to a market potential of 80,690 liters. These two crops contribute significantly to the overall demand due to their extensive cultivation. Orange shows a moderate cultivated area of 70,083 hectares, but because of its higher average PGR use of 0.77 liters per hectare, the market potential is relatively high at 53,775 liters. Bengal gram, with an average area of 95,324 hectares and a usage rate of 0.34 liters per hectare, has a market potential of 32,329 liters. Vegetables, despite having a low average area of 10,541 hectares, contribute a market potential of 3,798 liters. In total, the cumulative market potential of PGRs across all five crops in the Amravati district is 267,279 liters, indicating a significant opportlitery for companies involved in the production and sale of PGRs. The high figures for soybean and cotton particularly highlight where marketing and distribution efforts should be focused.

Market share of Plant Growth Regulators: The table 3 revealed the market share of major companies selling Plant

Growth Regulators (PGRs) in selected tehsils of Amravati district.

Table 3: Market share of plant growth regulators in selected tehsil of Amravati district

Sr no	Company Name	Quantity sold (liter)	Market share (per cent)
1	Bayer	311	25.72
2	Syngenta	275	22.75
3	Rallis India Limited	231	19.11
4	Godrej Agro vet	221	18.25
5	Adama Agriculture solution	171	14.14
6	Total	1209	100.00

The table 3 revealed the market share of major companies selling Plant Growth Regulators (PGRs) in selected tehsils of Amravati district. Among the five companies listed, Bayer holds the largest market share, with 311 liters sold, accounting for 25.72 per cent of the total market share. Syngenta follows closely with a 22.75 percent market share and 275 liters sold, showing its significant reach and customer trust. Rallis India Limited comes next with 231 liters sold (19.11percent), while Godrej Agro vet has a market share of 18.25 per cent with 221 liters sold**.** Adama Agriculture Solutions holds the smallest share among the five, with 171 liters sold, making up 14.14 percent of the market share. Although its share is relatively lower, it still represents a notable portion of the PGR market. This data indicates a competitive market among leading agroche mical companies, with Bayer and Syngenta being the top players. The presence of multiple companies with significant shares also reflects farmers' varied preferences based on product performance, availability, and pricing.

The awareness and adoption of Plant Growth Regulators among farmers

Awareness about plant growth regulators defined as kind of activities carried out by the farmers on quality and standard of output by them. The overall awareness and adoption of plant growth regulators by farmers was availed on a two point such as "Yes" and "No". Understanding the level of awareness and adoption among farmers is crucial for evaluating the current usage and future adoption potential of Plant Growth Regulators (PGRs).

Table 4: Awareness of plant growth regulators among farmers

Sr. No.	Statements	Aware	
		Frequency	percentage
1	Do you know about PGRs?	60	100
2	Do you know which companies are manufacturing PGRs?	45	75.00
3	Do you know about the quality of PGRs?	49	81.50
4	Do you know which PGR is used in your crop?	51	85.00
5	Do you know the method for application of PGRs?	52	86.67
6	Do you know the recommended dosage of PGRs?	50	83.33
7	Do you know the most suitable time for application of PGRs for the best result?	52	86.70
8	Do you know which precautions should be taken while application of the PGRs?	51	85.00
9	Do you know about the price of the PGRs?	48	80.00
10	Do you know about size of packing available for PGRs?	51	85.00
11	Do you aware about PGRs from Krushi Seva Kendra?	50	90.00
12	Do you aware about PGRs from neighboring farmer ?	49	81.00
13	Do you aware about PGRs from social media and banner?	45	75.00

The table 4 highlighted the awareness level of farmers regarding Plant Growth Regulators (PGRs). It is observed that all farmers (100per cent) are aware of PGRs, showing complete familiarity with the concept. A significant number of farmers know about the proper application method (86.67per cent), the recommended dosage (83.33per cent), the most suitable time for application (86.70per cent), and the necessary precautions (85per cent).

Additionally, 85 per cent of farmers are aware of which PGR is suitable for their crop, and 80per cent know about the price. Awareness about the size of packing is also high (85 per cent). However, only 75 per cent of farmers are aware of the company's manufacturing PGRs and have learned about PGRs through social media or banners. Major sources of information include Krushi Seva Kendra (90per cent) and neighboring farmers (81 per cent), indicating that traditional and interpersonal channels are more effective than digital or promotional ones in spreading awareness.

Table 5:P Adoption of plant growth regulators among farmer

Sr. No.	Statements	Adoption	
		Frequency	percentage
1	Do you adopt qualitative products of PGRs?	60	100
2	Do you adopt the proper method for application of PGRs?	60	100
3	Do you apply as per recommended dosage of PGRs?	47	78.30
	Do you focus on most suitable time for application of PGRs for the best result?	42	70.00
5	Do you follow precautions while application of the PGRs?	60	100

This table 5 showed the adoption behavior of farmers regarding the use of Plant Growth Regulators (PGRs). It shows that 100 per cent of farmers adopt qualitative PGR products, follow the proper application method, and take necessary precautions during application. However, only 78.3 per cent apply PGRs as per the recommended dosage, and 70 per cent focus on applying them at the most suitable time. This indicates high overall adoption, but there is still some scope for improvement in dosage accuracy and timing for optimal effectiveness.

Constraint faced by farmers and retailers with respect to plant growth regulators

A study was conducted to determine the constraints faced by farmers when purchasing the plant growth regulators and the constraints faced by retailers in marketing products. The data was gathered from 60 farmers and 20 retailers in selected tehsils Amravati districts.

Table 6: Constraint faced by farmers with respect to use of plant growth regulators

Statements	Frequency	Percentage
Lack of technical knowledge	13	21.67
Lack of information about product	17	28.33
Lack of finance	35	58.33
Timely unavailability	17	28.33
Not willing to take risk	20	33.33
Slow result	15	25.00
High price	38	63.33

Tale 6 presented that constraints faced by farmers in the use of Plant Growth Regulators (PGRs). The most significant challenge reported was the high price of PGRs, affected 63.33 per cent of farmers, followed by a lack of finance (58.33 per cent), which limits their purchasing capacity. A considerable number of farmers (33.33 per cent) were not willing to take risks, and 28.33 per cent face issues like lack of information about the product and timely unavailability. Slow results (25 per cent) and lack of technical knowledge (21.67 per cent) are also noted as barriers. These findings suggested that economic constraints and limited access to reliable information are major hurdles in the effective adoption of PGRs among farmers.

Table 7: Constraint faced by retailers with respect to sale of plant growth regulators

Statements	Frequency	Percentage
Higher price	9	45
Competitive products	9	5
Timely unavailability	8	40
Lack of field staff	8	40
Inadequate promotional activity	9	45
Competition among the retailers	12	60
Less demand	5	25
Lower credit facility	11	55

Table 7 indicated that the key constraints faced by retailers in the sale of Plant Growth Regulators (PGRs). The most prominent constraint was competition among retailers, affecting 60 per cent of them, followed closely by lower credit facilities (55 per cent) and higher prices (45per cent)**.** Inadequate promotional activity is also a concern for 45 per cent of retailers, as it limits awareness and demand among farmers. Timely unavailability and lack of field staff are each reported by 40 per cent of respondents, indicating logistical and support related challenges. Additionally, 25 per cent of retailers point to less demand, and a small portion (5 per cent) face issues due to competitive products**.** Overall, the major challenges revolve around pricing, financing, market competition, and insufficient marketing and technical support.

Conclusion

The study revealed strong market potential for Plant Growth Regulators (PGRs) in Amravati district, with a total estimated demand of 2, 67,279 liters mainly driven by soybean and cotton cultivation. Although awareness of PGRs among farmers was high, gaps remained in knowledge about correct dosage and timing. Most farmers used quality products and proper application methods, but only a portion followed recommended practices fully. Major constraints faced by farmers included high prices, lack of finance, and limited technical knowledge, while retailers struggled with market competition, low credit availability, and poor promotional support**.** Overall, the study highlights the need for training, financial support, and better supply systems to increase adoption and unlock the full potential of PGRs for sustainable agriculture in the region.

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