

Production trend of herbicides

vis-à-vis other pesticides in India

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Pests are the reason for severe crop losses around world leaving millions of people without enough food to eat. Pests adversely impact the primary source of income of rural poor. Weed menace is considered as a serious problem in Indian agriculture. Weeds are not only yield reducers, but in many instances, economically more harmful than other crop pests like insects, fungi etc. Chemical method or use of herbicides is considered as the most effective and easiest method of weed management. Production trend of herbicides in relation to other pesticides during the period from 2015-16 to 2019-20 gives a deep insight. The total pesticide production was increasing till 2018-19 and declined by 25 thousand MT in 2019-20 as compared to the previous year whereas herbicide production showed a meagre decline of 3 thousand MT in production during the same period. Compound annual growth rate calculation indicated that highest growth rate of production (4.7%) was registered by herbicides among other group of pesticides. Further, herbicide production share in total pesticides has increased from 17% in 2015-16 to 20% in 2019-20 whereas declining trend was observed in case of fungicides. Barring glyphosate, all other key herbicides depicted a positive compound annual growth rate from 2015-16 to 2019-20 and metribuzin recorded highest (30.68%) growth rate among others.

Keywords: Glyphosate, Growth rate, Herbicides, Metribuzin, Pesticides, Weeds

PEST refers to any animal or plant causing harm or damage to people or their animals, crops or possessions, even if it only causes annoyance. Wide range of organisms including insects, mites, rodents, slugs, snails, nematodes, cestodes, weeds, fungi, bacteria and viruses are considered as pests in agriculture. These pests cause huge crop yield loss every year. As much as 40% of the world's agricultural crops are lost to pests each year. Further, invasive pests cost countries at least \$70 billion annually and are one of the main drivers of biodiversity loss, according to estimates from the Food and Agriculture Organization of the United Nations (FAO). Serious damage caused by these pests leaves millions of people without sufficient food to eat and it adversely impacts

the primary source of income of rural poor. About 30-40% of annual crop yield in India is getting wasted due to various agricultural pests. Pesticides play major role in controlling various pests in agriculture up to certain extent and thereby prevent crop damage to cent-percent level. The term pesticide covers a wide range of compounds including insecticides, fungicides, herbicides, rodenticides, molluscicides, nematicides, plant growth regulators and others. Worldwide, 40% of pesticide use is contributed to herbicides, 17% to insecticides and 10% to fungicides. By using pesticides to ensure maximum crop yield, farmers are able to save money. Some estimates suggest there is a four time return on pesticide investments.

Weeds are considered a serious

menace in agriculture. Crop yield loss due to weeds in India is estimated to be about US \$11 billion every year. If we do not control weed growth at critical stage, it may cause crop loss as high as 70%. A study conducted on 10 major crops revealed these statistics. Weeds are not only yield reducers, but in many instances, economically more harmful than insects, fungi or other crop pests. Introduction of selective herbicides in late 1940s and subsequent discovery of new herbicide molecules provided a wonderful tool of weed management to farmers called "Chemical hoe". Herbicides continue to be one of the most effective and easiest tools for weed management in India as well as world. Though there are growing environmental concerns over the intensive use of herbicides,

Table 1. Countrywise pesticide use

Rank	Country	Pesticide use (tonnes)	Pesticide per hectare of crop land (kg)
1	China	1763000	13.1
2	United States	407779	2.5
3	Brazil	377176	6
4	Argentina	196009	4.9
5	Canada	90839	2.4
6	Ukraine	78201	2.3
7	France	70589	3.6
8	Malaysia	67288	8.1
9	Australia	63416	2
10	Spain	60896	3.6
11	Italy	56641	6.1
12	Turkey	54098	2.3
13	India	52750	0.3
14	Japan	52249	11.8
15	Germany	48193	4
	Average	229275	4.9

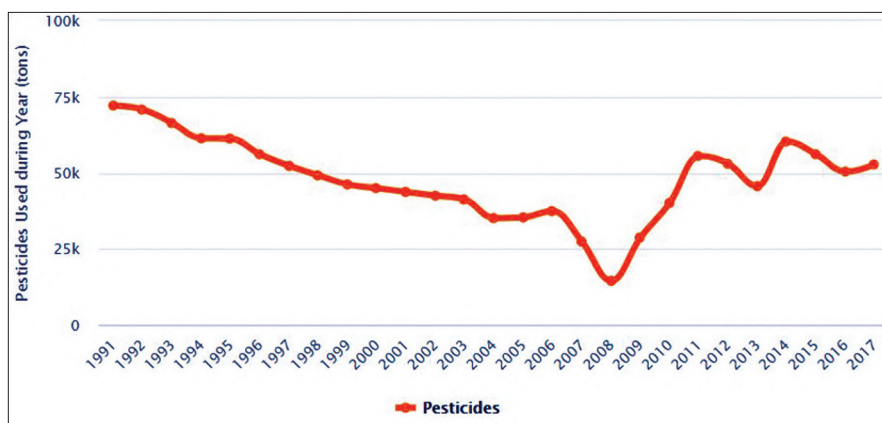
Source: FAO stat, www.worldometers.info

there is no better and effective alternative. Nevertheless, judicious use of herbicides for weed management has a significant place in Indian agriculture particularly considering large chunk of small and marginal farmers in the country.

Pesticide use in India

Table 1 depicts countrywise pesticide use in the world. Top 15 countries are ranked on basis of total pesticide use (as of 2017). China tops the chart with 17,63,000 tonnes of pesticides and per hectare usage of 13.1 kg, which is remarkably high as compared to other countries. The United States is the next largest consumer of pesticides. It used 4,07,779 tonnes of pesticides with a per hectare usage of 2.5 kg. Pesticides are so common in United States that even common citizens apply them to lawns, and municipalities use them for parks.

India's global ranking is 13th in terms of total pesticide use (52,750 tonnes) and the per hectare usage is just 0.3 kg. Both total usage as well as per hectare usage of pesticides is very much low in India as compared to other countries and the average data. In terms of per hectare crop land, India occupies 113th rank among other countries in the world. Further, if we look at the period from 1991 to 2008, overall decline was



Trend of annual pesticide use in India (1991 to 2017) (Source: FAO stat and www.worldometers.info after 2008)

observed in annual pesticide usage trend in India. However, after a steep decrease from 37,423 tonnes in 2005 to 14,485 tonnes in 2008, the per year usage of pesticide in India has witnessed an increasing trend and it reached 52,750 tonnes in 2017. Though there was slight dip of usage in 2012 and 2013, an overall increasing trend could be seen in annual pesticide use in India (1991 to 2017).

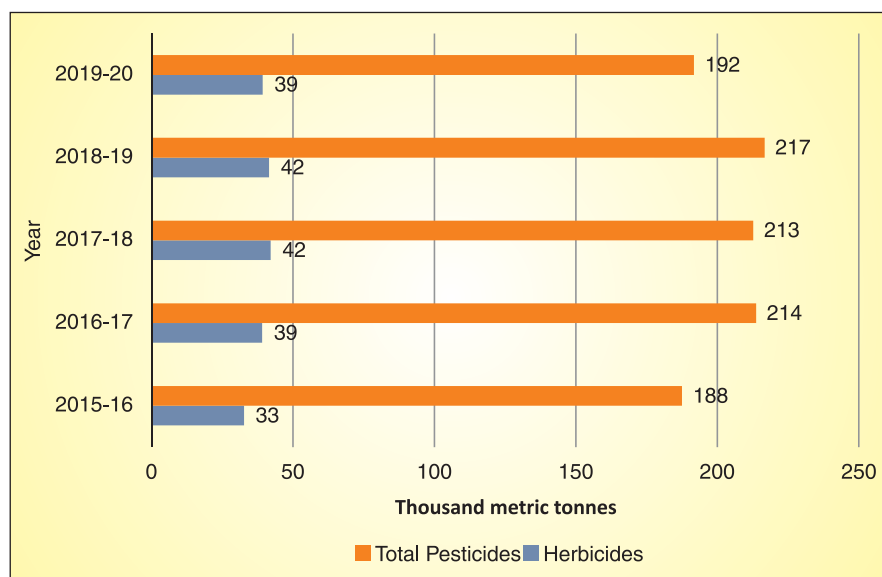
Volume of production in India: Herbicide vis-à-vis total pesticides

It was indicated that total pesticide production has increased from 188 thousand MT in 2015-16 to 192 thousand MT in 2019-20. However, the highest production (217 thousand MT) was observed in 2018-19. It was on increasing trend till 2018-19 and showed decline of 25

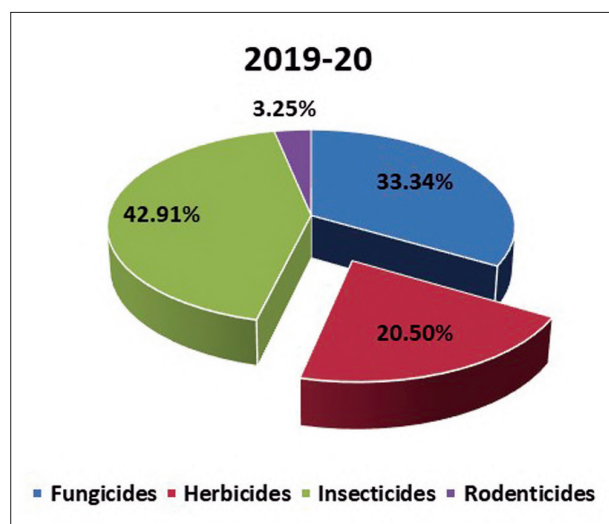
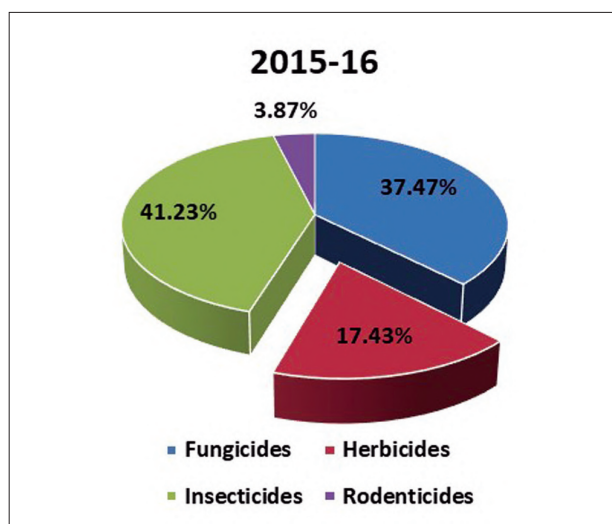
thousand MT in 2019-20 as compared to the previous year. Production volume of herbicides also indicated similar trend during this period. It was 33 thousand MT in 2015-16 and reached 39 thousand MT in 2019-20. Highest production (42 thousand MT) was observed in both 2017-18 and 2018-19. A dip of 3 thousand MT was recorded in 2019-20 as compared to previous year.

Position of Herbicides in Pesticide Group

Total pesticide production in the country depicted a compound annual growth rate of 0.56 during 2015-16 to 2019-20 (Table 2). Production of herbicides topped with 4.72% followed by insecticide with 1.57%. Interestingly, fungicides and rodenticides showed negative growth



Volume of herbicides and total pesticides produced in India from 2015-16 to 2019-20 (Source: Department of Chemicals & Petro-Chemicals, Ministry of Chemicals & Fertilizers)



Percent share of different pesticide groups in total volume of pesticides produced in 2015-16 and 2019-20. (Source: Department of Chemicals & Petro-Chemicals, Ministry of Chemicals & Fertilizers)

rate of -2.33% and -3.72% respectively. Further, we could say that, the dip in total pesticide production observed in 2019-20 is mainly due to the decreased production of fungicides and insecticides. Banning of various pesticide molecules in recent past could be the reason for registering the declined production. Percent share of different pesticide group for the year 2015-16 and 2019-20 showed more or less similar pattern in terms of percent share of production. Insecticides occupied the top position with more than 40% followed by fungicides with more

than 30% in both the years. However, herbicides production share has increased from 17% in 2015-16 to 20% in 2019-20 whereas fungicides production share has declined from 37 % to 33 % during this period.

Production Trend of key Herbicides in India

Volume of production and compound annual growth rate of key herbicides produced in India is given in Table 3. Only the key herbicides for which time series data were available have been considered for this analysis. Perusal of the table indicates that all these key herbicides

together recorded a compound annual growth rate of 6.3% during 2015-16 to 2019-20. Barring Glyphosate, all other herbicides showed a positive growth rate of production during this period. Of the six key herbicides, Metribuzin registered highest growth rate (30.68%) followed by Diuron (28.14%) and Pretilachlor (12.11%). In terms of volume production, 2,4-D contributed highest with more than 22 thousand MT followed by Glyphosate (5.9 thousand MT) and Diuron (3.4 thousand MT).

SUMMARY

Pesticide use in India is very low as compared to other countries. All group of pesticides and herbicides have an important role to play in Indian agriculture. Herbicides or chemical method of weed management is considered as the most effective tool to deal with the weed menace in crops. The pesticide market in India is one of the billion rupees markets of the country. Hence, understanding the production trend of various herbicides in relation to the other group of pesticides has great significance. It would help provide an overall picture of domestic production scenario of herbicides which in turn will help forecast supply-demand gap of the same.

Table 2. Production trend of different pesticide group during the period 2015-16 to 2019-20

Pesticide group	Volume of production (in thousand metric tonnes)					CAGR (%)
	2015-16	2016-17	2017-18	2018-19	2019-20	
Fungicides	70.261	81.812	73.743	72.883	63.936	-2.33
Herbicides	32.687	39.117	42.114	41.56	39.307	4.72
Insecticides	77.324	85.077	90.676	96.087	82.282	1.57
Rodenticides	7.25	7.712	6.166	6.173	6.23	-3.72
Grand Total	187.522	213.718	212.699	216.703	191.755	0.56

Source: Department of Chemicals & Petro-Chemicals, Ministry of Chemicals & Fertilizers.

Table 3. Compound annual growth rate of key herbicides production in India

Herbicide	Volume of production (in thousand metric tonnes)					CAGR (%)
	2015-16	2016-17	2017-18	2018-19	2019-20	
2,4-D	18.46	23.36	25.83	24.24	22.56	5.14
Atrazine	1.21	1.90	2.25	1.48	1.73	9.35
Diuron	1.26	3.68	3.26	3.62	3.40	28.14
Glyphosate	6.96	6.35	6.29	6.68	5.91	-4.00
Metribuzin	0.91	1.12	0.88	1.92	2.65	30.68
Pretilachlor (Technical)	1.94	2.58	3.60	3.63	3.07	12.11
Total	30.74	38.99	42.11	41.56	39.31	6.34

Source: Department of Chemicals & Petro-Chemicals, Ministry of Chemicals & Fertilizers.

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