International Journal of Science and Research (IJSR)
ISSN (Online): 2319-7064
Index Copernicus Value (2016): 79.57 | Impact Factor (2017): 7.296

Evaluation of Bio-Pesticides use for Crop Protection in Afghanistan

Dr. Mohammed Zarif Sharifi[1], Wasima Sharifi[2]

[1]Professor, Department of Agronomy, Faculty of Agriculture, Kabul University, Karti-sakhi Jama Mina, Afghanistan

[2]Assistant Professor, Department of Biochemistry, Faculty of Allied Science, Kabul Medical University, Afghanistan

Abstract: ***Over the past 50 years, crop protection has relied heavily on synthetic chemical pesticides, but their availability is now declining as a result of new legislation and the evolution of resistance in pest populations. Therefore, alternative pest management tactics are needed. Bio-pesticides are pest management agents based on living micro-organisms or natural products. They have proven potential for pest management and they are being used across the world. However, they are regulated by systems designed originally for chemical pesticides that have created market entry barriers by imposing burdensome costs on the bio-pesticide industry. There are also significant technical barriers to making bio-pesticides more effective. The objective of this study is to inventory the current state of bio-pesticide usage in Afghanistan to better understand how, where and to what effect these products are being used in order to inform necessary policy innovations. In Afghanistan, a greater emphasis on bio-pesticides as part of agricultural policy may lead to innovations in the way that bio-pesticides are regulated. There are also opportunities for developing use of bio-pesticides in Afghanistan because of its new technology. The new bio-pesticide products that imported in Afghanistan will result from this review will give opportunities for farmers to protect their agricultural products from pests.***

Keywords: bio-pesticide, Inventory of bio-pesticides, regulation

1. Introduction

Raising crop productivity and production are becoming increasingly important to meet growing food requirements imposed by the incessantly increasing the world population (21), which is expected to reach 8 billion by 2020, that higher population necessities greater food production (15, 16, 17). Over the next 20 years, crop production will have to increase significantly to meet the needs of a rising human population. This has to be done without damaging the other public goods—environment and social—that farming brings (1, 4).

Afghanistan is an agricultural country with more than 80% of the population relying on agriculture for their livelihood. Approximately one-third of the population is food insecure and will require agricultural assistance. The total annual cereal requirement for Afghanistan is estimated at 6.5 million tons, however there is a cereal deficit of 753,000 tons—better, more widely affordable and effective tools for crop pest management are necessary in order to address this issue. The leading cereal production in Afghanistan is shown in (Table 1). In Afghanistan, a greater emphasis on bio-pesticide usage as part of agricultural policy will lead to innovations in the way that bio-pesticides are regulated, allowing for a wider availability that will make the technology more accessible to farmers. (9, 14).The total land area in Afghanistan is 65,223, 000 hectares that divided to temporary land 47%, forest and woodland 18%, irrigated crops areas 23% and cultivated rainfed areas 12% (Fig. 1.).Historically, crop protection in Afghanistan has relied heavily on synthetic chemical pesticides. Due to the evolution of resistance in pest populations and growing awareness of environmental protection, alternative pest management tactics are needed. However, alternative bio-pesticides are regulated by systems designed originally for chemical pesticides that have created market entry barriers by imposing burdensome costs on the bio-pesticide industry. (8, 13).

The most commonly used bio-pesticides are: bio-fungicides (*Trichoderma*), bio-herbicides (*Phytopthora*), and bio-insecticides (*Bacillus thuringiensis*) in the world but in Afghanistan, currently the bio-fungicide of (*Trichoderma*) is used. The interest on bio-pesticides is based on the advantages associated which such products which are: (i) inherently less harmful and less environmental load, (ii) designed to affect only are specific, pest or, in some cases, a few target organism, (iii) often effective in very small quantities and often decompose quickly, thereby resulting in lower exposure and largely avoiding the pollution problem and (iv) when used as a component of Integrated Pest Management (IPM) programs, bio-pesticides can contribute greatly (7,11, 19).

The objective of this study is to inventory the current state of bio-pesticide usage in Afghanistan to better understand how, where and to what effect these products are being used in order to inform necessary policy innovations

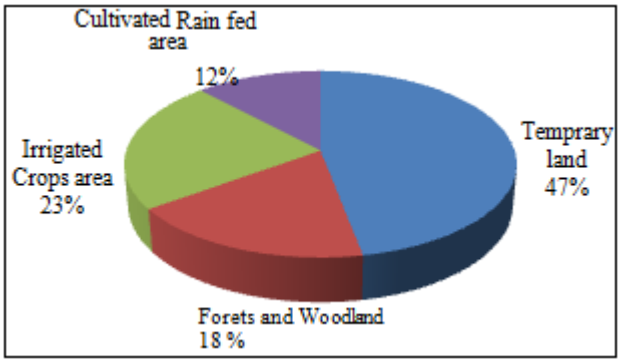

Figure 1: Total land areas of Afghanistan (3).

Table 1: Leading Cereal Crop Production in Afghanistan (2014-2017) million tone) (3)

Crop	2014-15	2015-16	2016-17
Wheat	5.30	4.60	4.50
Rice	5.30	4.10	3.50
Barley	5.20	4.10	3.10
Corn	3.10	3.10	3.10
Total Cereals	18.9	15.9	14.2

2. Materials and Methods

Data from publications of the Department of Plant Protection at the Ministry of Agriculture, Irrigation and Livestock was analyzed in order to assess the extent of bio-pesticide use by Afghan farmers. The types of data were collected by region: types of bio-pesticides used, techniques for dispersion of pesticides, and amount of agricultural land affected by bio-pesticide use.

3. Results and Discussions

3.1. Policy and Institutions Regulating Pesticides Use

Current bio-pesticide regulations in Afghanistan are significantly efficient, even acknowledging the difficulties associated with determining pesticide policies. They can be greatly improved by incorporating economic considerations into the policy process. Moving from bans toward financial incentives and flexible policies that will allow chemical use where the benefit cost ratios are high will improve resource allocation. (5, 10).

3.2. Inventory of bio-pesticides used in Agriculture sector

Various types of bio-pesticides such as bio-insecticide, bio-fungicide, bio-herbicide, bio-nematodcides, etc. are used for different applications like seed treatment on farm application and others in the world. Worldwide there are about 1400 bio-pesticide products being sold. At present, there are 68 bio-pesticide active substances registered in the EU and 202 in the USA (12).Growth in bio-pesticides market is rising with increasing organic products consumption which is driven by important factors such as increasing consumer awareness towards organic benefits. Governments in different countries have already started encouraging for the development of bio-pesticides due to their low toxicity, safety, and high efficacy in pest control (3,6).

In Afghanistan there are just three bio-pesticides introduced by some company during 2- 3 years because of so many reasons like lack of extension, knowledge of farmer about bio-pesticide use. (Table 2). The quantity of bio-pesticides use is shown in (Table 3).

Table 2: Number of bio-pesticides used in Afghanistan (9)

Bio-pesticide product	Target crop	Target Pest/disease	Application mode	Application rate	Remarks
Traichodarma	Vegetables	Fungal diseases & Soil fertilizer	Ground application equipment	2 table spoon per litter	Used in Takhar and Badakhshan Provinces
Madex plus	Apple, pear, walnuts, quinces, apricots, peaches, almonds	Codling Moth	Ground application equipment	100 ml per ha	Used in 15 provinces
Dipel 150 Dust	Vegetables Cabbage	cabbage leafppers, imported cabbage worms and grape leaf folder	Powdering by hand equipment	14 Kg/ha	Kabul province

Table 3: Quantity and extant use of bio-pesticides in Afghanistan (9)

Bio- pesticide products	Quantity used	Area coverage (Hectare)
Traichodarma	20 kg	20 ha
Madex plus	20 L	200 ha
Dipel 150 Dust	1 Tone	7.15 Ha

3.3. Best practices in bio-pesticide application in Afghanistan

Because of insufficient existence of bio-pesticides in Afghanistan, thereis nopractice widely available in many agricultural areas of the country aswell as farmers have not completely knowledge about bio-pesticides and their usage. In my opinion the bio-pesticides practice must be learned for farmer around the country. It is the responsibility of Ministry of Agriculture, Irrigation and livestock of Afghanistan to importthe useful bio-pesticides for a short time and for a long time bio-pesticides should produce in Afghanistan and the application method expanded around the country (21).

3.4. Success stories in bio-pesticide use in Afghanistan

As mentioned on above, the history of bio-pesticides is not so many in Afghanistan because of the number of bio-pesticides usage are limited. It is mentioned for responsible organizations (Government of Afghanistan and donor countries) to attend the currently agriculture situation of Afghanistan. During 2-3 years just the following bio-pesticides imported and used in some regions of Afghanistan.

1) The bio-fungicide, Trichoderma, is used in two provinces to fight fungal diseases in vegetables. Ground application equipment is used to disperse this pesticide utilized in a total of 20 hectares of farmland.
2) Madex plus is used in 15 northern provinces to control *codling moth* in apple production. Ground application equipment is used to disperse this pesticide utilized in a total of 200 hectares of farmland.
3) Dipel 150 dust is used by Kabul University's Faculty of Agriculture to prevent cabbage worms and grape leaf folder in leafy vegetable production. Powdering by hand techniques are used to disperse this pesticide utilized in a total of 2 hectares of farmland (9).

Therefore, stories have been not found so longer in the country however, the effects of mentioned bio-pesticides

used in Afghanistan are successful in crop protection. In case of Afghanistan, still here is no factory to produce bio-pesticides.

3.5. Future prospects

Government is likely to continue imposing strict safety criteria on conventional chemical pesticides, and this will result the import of bio-pesticides from outside the country. Perhaps the biggest advances in bio-pesticide development will come through exploiting knowledge of the genomes of pests and their natural enemies. This information will give us new insights into the ecological interactions of pests and bio-pesticides and lead to new possibilities for improving bio-pesticide efficacy. Situation of Afghanistan is very suitable for product the bio-pesticides because of it's an agricultural country. On the other hand, organic resources are available in many Provinces of Afghanistan (20).

4. Conclusion and Recommendations

The results show that bio-pesticide use in Afghanistan is still limited. Bio-pesticides are not being widely used in Afghanistan currently due to existing industry regulations and due to lack of awareness and knowledge of these products (18).

According to the situation of Afghanistan, bio-pesticides was increased in all over the world therefore, our recommendations are as follow.

- Add information on usage of chemical pesticide in the country for comparison.
- Involve the extension system to reach the farmers.
- Bio-pesticide regulation necessary.
- Adaptive research on imported bio-pesticide needs to be strengthened.
- Work on how to improve the availability and then the use of bio-pesticides.
- Need to strongly involve extension in order to reach bio-pesticide technologies to the farmers.
- Needs regulation for bio-pesticides like the convention pesticides as there aren't any regulations on bio- pesticides as of now.

References

[1] Bastiaans, L., Paolini, R., Baumann, D.T. (2008). Focus on Ecological Weed Management: What is Hindering Adoption? Weed Res. 48: 481–491.
[2] Bettiol, W. (2015). Bio-pesticide use and Research in Brazil. Brazilian Res. J. 6: 280-283.
[3] Central Statistic Organization. (2016-17). Afghanistan Statistical Yearbook. pp: 22-24.
[4] David, Z., and Katti, M. (1997). Pesticide Use and Regulation: Making Economic Sense out of an Externality and Regulation. Nightmare J. of Agri. and Res. Econ. 22:321-332.
[5] David, C., A. Bailey, G. Mark,G. Davidson,J. U. Greaves, and .Wyn, P. Grant. (2010). The Development, Regulation and use of Bio-pesticides for Integrated Pest Management.
[6] Global Biopesticides Market – Trends & Forecasts. (2012 – 2017).Worldwide Industry Latest Market Share, Strategy, Growth, Size, Trends and Forecast.Available at:Blog: http://mresearchreports.blogspot.com.
[7] Gupta, S., and Dikshit, A.K. (2010). Bio-pesticides: An Eco-friendly Approach for Pest Control. J.of Bio-pesticide. 3:186-188.
[8] Heinz, W.S. (2004). Inventory of Agricultural Pesticide use in the Danube River Basin Countries.
[9] Kawasaki, S., F. Watanabi, S. Suzuki, R. Nishimaki, and S. Takahashi. (2012). Current Situation Issues on Agriculture of Afghnistan.J. of Arid Land Studies. 22-1: 345-348.
[10] kumar, S. (2015). Bio-pesticides: An Environment Friendly Pest Management Strategy. J. of Bio-fertilizers and Bio-pesticides. 6:103-109.
[11] Oerke, E.C., Dehne, H.W. Schoenbeck, F. Weber, A. (1994). Crop Production and Crop Protection: Estimated Losses in Major Food and Cash Crops. Amsterdam, the Netherlands: Elsevier Science Publishers B.V.
[12] Pervez, M.S., Michael, B. James, R. (2014). Mapping Irrigated area in Afghanistan over the Past Decade using MODISNDVI. Remoto Sensing of Evironment.149: 155-165.
[13] Pretty, J. (2008). Agricultural Sustainability: Concepts, Principles and Evidence. Phil. Trans. R. Soc. B. 363: 447–465.
[14] Rosa, E.R., and Brian B.M.(2008). Microbial Bio-pesticides for the Control of Plant Diseases in Organic Farming.Department of Plant Pathology, Ohio State University.Agriculture and Natural Resources.
[15] Sharifi, M.Z., S. Matsumura. (2012). Effects of Timing of Nitrogen Application and Irrigation on Corn Growth. Journal of Field Science, Japan10: 1-7.
[16] Sharifi, M.Z., S. Matsumura, T. Hirasawa, and M. Komatsuzaki. (2009). Apparent Nitrogen Mineralization Rate of Several Green Manures Incorporated in Soil and the Application Effects on Growth of Komatsuna Plants. Japn. J. Farm Work Research. 44: 163-172.
[17] Sharifi, M.Z., S. Matsumura, T. Hirasawa, and M. Komatsuzaki. (2011). Improvement of Nitrogen Balance by Rotating Corn and Hairy vetch.Japn. J. Farm Work Research. 46: 167-177.
[18] Sharifi, M.Z. (2013). Biological Weed Control and its Relation to Herbicides and Environment.Presentation in Conservation Environment at Kabul University.July4-8 (2013).
[19] Speranza, C.I., Kiteme, B. Wiesmann, U. (2008). Droughts and Famines: The Underlying Factors and the Causal Links Among Agro-pastoral Households in semi-arid Makueni District, Kenya. Glob. Environ. Change 18: 220–233.
[20] Thebo, A.L., Pay, D. E.F. Lambin.(2014). Global Assessment of Urban and Pre-Urban Agriculture: Irrigated and Rainfed Croplands. Envir.Reas. 11: 200-2012.
[21] Yildirim, E. and I. Guvence. (2005). Intercropping based on Culiflower: More Productive, Profitable and High Sustainable. Europ. J. Agron. 22: 11-18.