Although the famous Wedderburn theorem on commutativity of finite division rings was established in early twentieth century, yet it was during the past four decades that striking results concerning with conditions which, when imposed on a ring, render the ring commutative or almost commutative, were obtained. The structure theory for rings as developed after 1940 accelerated the progress of the subject which was earlier restricted due to the lack of cancellation property in general class of rings. Besides mathematicians like Amitsur, Baer, Braur, Cartan, Faith, Jacobson, Kaplansky, McCoy and Levitzki this study has attracted a wide circle of Algebraists — to mention a few: Herstein, Nakayama, Yaqub, Chacron, Luh, Kezian, Ligh, Lichtman, Richox, Bell, Tominaga among many more. The present thesis entitled "A study of some polynomial identities which imply commutativity for rings" is a part of my research work in this direction carried out during the past five years.

The material of the thesis has been arranged into five chapters. Chapter 1 is a general introduction consisting of some basic notions, relevant definitions and important known results, which are used in the subsequent chapters. No attempt is however made to give details or to include the proofs of the well-known results.
Chapter 2 contains some simple commutativity conditions for associative rings and could be treated as introduction to the subject. The main focus is on some of those identities which imply commutativity through elementary substitutions. Included are the identities (i) \((xy)^2 = xy^2x\), (ii) \([x,y]^2 = [x^2,y^2]\), (iii) \((xoy)^2 = x^2oy^2\), (iv) \([x,y^2] = [x^2,y]\), (v) \(xoy^2 = x^2oy\) and (vi) \([x^m,y^n] = 0\). In Chapter 3, we investigate the commutativity of semi prime rings under certain hypotheses. This chapter falls naturally into two parts. The first part comprising section 3.2 – 3.4, contains the results whose development depend mainly on the material of Chapter 2, exploiting the 'Centre' of the ring. In the paper [61] Johnsen, Outcalt and Yaqub established that a ring with unity 1 satisfying \(x[y,xy] = o\) must be commutative. We replace the identity of the mentioned result by \(x(yoxy)\) and investigate the commutativity of semi prime rings in section 3.5 while a theorem of Bell [11] motivates to obtain the main result of section 3.6 which states as follows: If in a semi prime ring \(R\) there exists a positive integer \(n > 1\) such that \([x^k,y] + [x,y^k] \in Z(R)\) for \(k = n, n+1\), then \(R\) is commutative.

It is well-known that Boolean condition, namely \(x^2 = x\) for each ring element \(x\) forces commutativity. Thus in a Boolean ring \(R\), \((xy)^2 = xy\) and \((xy)^2 = yx\) hold for all \(x, y \in R\). But there exist non-Boolean rings satisfying above identities. In Chapter 4, we discuss the commutativity of
these larger classes of rings. Section 4.2 and 4.3 deal with the commutativity of semi prime rings satisfying 
\((xy)^n - yx \in Z(R)\). In the last section we extend the study to the associative ring with unity imposing torsion condition on additive abelian group of the ring. The results obtained in this chapter must be looked as extensions of the famous Jacobson theorem (Proposition 1.3.5) and the classical theorem of Wedderburn (Proposition 1.3.12).

Chapter 5 contains generalizations of some well-known commutativity theorems. In section 5.2, a result of Kaplansky [64] which was developed by Herstein [39] has been extended as follows: "Let \( R \) be a semi prime ring and \( n \) be a fixed positive integer larger than 1 such that \( [x^n, y] \in \mathbb{Z}(R) \) for \( x, y \in R \). Then \( R \) is commutative." The main theorem obtained in section 5.3 is an extension of a theorem of Lichtman [80]. In section 5.4, a theorem of Bell [13] has been generalized which is further extended for left s-unital rings in section 5.5. Finally, the study as initiated by Herstein [39] and subsequently developed by many research workers including Putcha and Yaqub [92] motivates to establish the following result: Let \( R \) be a semi prime ring with the property that for each \( x, y \in R \), either there exists \( p_{xy}(\lambda) \in \lambda^2 Z[\lambda] \) for which \( [xy - p(xy), x] = 0 \), or there exists \( q(\lambda) \in \lambda^2 Z[\lambda] \) for which \( [xy - q(xy), y] = 0 \). Then \( R \) is commutative.
At places examples are provided to show that the conditions imposed in the hypotheses for various results are not superfluous. The generalizations of some of the results presented in the exposition can not be ruled out but the choice of our examples shows that they can not be extended arbitrarily. The definitions, the examples and the results in the text have been specified with double decimal numbering. The first figure represents chapter, the second denotes section and the third demonstrates the number of the definition, the example, the lemma, the theorem or the proposition as the case may in a particular chapter. For example Theorem 2.5.4 refers to the fourth theorem appearing in section 5 of the second chapter.

To meet the requirement of class (viii) chapter XXV of Academic Ordinances of Aligarh Muslim University, every chapter and its sections are well-equipped with comprehensive introduction, pointing out the important results obtained.

Two papers based on some portions of chapter 3 have been accepted for publication in Math. Student and Communications while a portion of Chapter 5 is to appear in Bull. Inst. Math. Acad. Sinica (1937) Vol. 15, No. 3. Also two papers already been published in Bull. Austral. Math. Soc. Vol. 33 (1986) and Soochow J. Math. Vol. 11 (1985), include material from Chapter 4 and Chapter 5 respectively.